DOCUMENT RESUME

ED 172 725 IR 007 200

AUTHOR Marsh, Patrick O.; Koeppl, Raymond P.
TITLE Demand Access Instructional Radio: A Report on an Innovative Project for the CSUC System.
INSTITUTION California State Univ., Sacramento.
SPONS AGENCY California State Univ. and Colleges, Los Angeles. Office of the Chancellor.
PUB DATE 15 Jan 79
NOTE 104p.; All appendices except Appendix C have been removed due to marginal legibility

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Audiotape Recordings; *Autoinstructional Programs; *Core Courses; *Educational Radio; Higher Education; Instructional Innovation; Media Research; Media Technology; Program Budgeting; *Program Evaluation; *Statistical Data
IDENTIFIERS Marsh Model; Message Design

ABSTRACT

An undergraduate core course covering the entire range of communication studies was content analyzed, scripted, and audiotaped for broadcast in 20 half-hour segments. The formats of the tapes included interviews, panel discussions, expository lectures, fabled narratives, and radio drama. An evaluation of the audiotaped materials was conducted by an external evaluator and consisted of a comparison between a group of students using the audiotaped materials and a group given a lecture course on the same content. The results of the evaluation favored further development of the audiotaped format, as it effectively delivered information to many students in considerably less time than the lecture course. A bibliography is included at the end of the first chapter, and the statistical analyses of the evaluation data are appended. (Author/JEF)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED172725

IR

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

# DEMAND ACCESS INSTRUCTIONAL RADIO: A REPORT ON AN INNOVATIVE PROJECT FOR THE CSUC SYSTEM

Submitted by:

Patrick O. Marsh, Ph.D.

and

Raymond P. Koegel, Ph.D.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Patrick O. Marsh
Raymond P. Koegel
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

January 15, 1979

IR000300

## Abstract

The project described in this report was funded to mediate one of the core courses in the Department of Communication Studies, California State University, Sacramento. The content of the course was a survey of the entire range of communication studies and the format chosen to mediate the course was audio tape. The course content was divided into material suitable for 20 half-hour audio tapes. The formats of the tapes included interviews, panel discussions, expository lectures, fabled narratives, and radio drama. All of the tapes were designed using prespecified content objectives as well as style parameters derived from a developed theory of message design. The tapes were scripted and produced during the Fall and Winter, 1977-78.

The tapes were broadcast and utilized in a demand access autotutorial mode for students in two sections of CS 100A. A third party evaluator compared the results of the group using the audio materials with a strictly controlled group given a lecture course. There was a significant difference between the experimental and control groups which favored the use of audio tapes over the lecture format. The results of this project suggest that new delivery systems such as SCA can be utilized so that a delivery system can be developed for audio systems of this type. The tapes are currently being used and are allowing for teaching larger numbers of students in considerably less time. At the end of the three year

period specified in the grant, a cost benefit analysis can be undertaken which will assess the exact amount of savings that these tapes allowed.

## Preface

The project report which follows presents a complete picture of the instructional radio activities funded by the CSUC Chancellor's Office. For clarity of understanding, it would be best for the reader to approach the report in the following fashion: first, for the initial grant narrative Appendix A should be read; second, for the project's interim report Appendix B should be reviewed; third, the narrative of the report and lastly, the evaluation report. Approached in this manner, the project report provides a chronological overview of the project's evolvement.

## TABLE OF CONTENTS


| | Page |
|---|---|
| Preface | i |
| CHAPTER I<br>The Development of Instructional Radio: The Context of the "On/Air" Project | 1 |
| CHAPTER II<br>The Message Design of the Programs | 20 |
| CHAPTER III<br>Budget | 39 |
| CHAPTER IV<br>Implementation | 44 |
| CHAPTER V<br>Findings and Implications Regarding the Impact of Complexity Profile and Program Format Upon "Liking" and "Learning" | 49 |
| APPENDIX A<br>Grant Proposal Narrative | 58 |
| APPENDIX B<br>Interim Report | 76 |
| APPENDIX C<br>Evaluation Report | 88 |
| APPENDIX D<br>Third Party Contracts | 125 |
| APPENDIX E<br>Air Time Schedule | 136 |
| APPENDIX F<br>Selected Message Prescriptions | 140 |

# CHAPTER I

## THE DEVELOPMENT OF INSTRUCTIONAL RADIO: THE CONTEXT OF THE "ON/AIR" PROJECT

In its long history, educational radio has served the public with cultural, educational, and entertainment programs, and has supplied students and teachers on all levels with instructional materials designed for classroom use. In addition to the educational institution's use of non-commercial radio, special interest groups such as the physically blind and handicapped have widely used radio as a major means of communication.[1] The major purpose of educational radio is to provide the general public and schools with quality service which does not duplicate commercial radio services.

Educational institutions were among the pioneers in the development of radio broadcasting. WHA, licensed to the University of Wisconsin in Madison, began experimental operation in 1919. With the advent of the authorization of FM broadcasting in 1944, the number of educational radio stations grew rapidly following the end of World War II. On January, 1978, more than 914 non-commercial radio stations were licensed on the FM band.[2] In addition to the educational radio broadcast stations on the FM band, a 1971 count of 500 carrier-current or wired-wireless campus systems were operated by educational institutions (These are closed circuit feeds to campus buildings and unlike educational radio stations on the FM band, they have no restrictions on advertising).[3]

However, even with the steady growth of educational radio stations, research in educational radio has historically been very sparse. In 1967, the National Association of Educational Broadcasts produced an overview of the status of educational radio entitled The Hidden Medium. Its authrrs note that:

> There is a profound lack of knowledge on educational radio which only research can fulfill .... the total job that needs to be done is so huge that more broad research is needed.[4]

HISTORY

The Radio Act of 1912 provided the first domestic law for control of radio in general, and made the Secretary of Commerce responsible for licensing radio stations and operators. Subsequent to the Radio Act of 1912, the Radio Act of 1927 created a five member Federal Radio Commission to issue station licenses, allocate frequency bands to various services, assign specific frequencies to individual stations and control station power.

The rapid growth of broadcasting and the competition for the limited spectrum space raised questions as to whether a minimum amount of broadcast time should be devoted to educational purposes, and whether certain frequencies should be reserved for educational radio. In 1925, almost one-third (171) of the 571 radio stations on the air were operated by educational institutions.[5]

For various reasons, notably the increased competition from commercial broadcasting, most of these stations went off the air by 1934 when the Federal Communications Commission was created. In 1941, FM broadcasting was authorized and five channels were set aside for non-commercial educational use. This took the place of the once previously allocated AM educational stations.

In 1945, as part of an extensive revision of frequency allocations, the commission reserved a total of 20 FM channels between 88 and 92 mhz for non-commercial educational FM stations. As part of the FCC's committment to help direct the development of educational broadcasting, the FCC authorized lower power (10 watt) operation on educational FM channels in 1948. This enabled an educational group to begin broadcasting over a limited two to five mile radius for an outlay of a few thousand dollars in equipment. This allowed educational institutions to experiment at a minimum cost with the option to expand their radio operations at a future date or as their instructional needs developed.

Pursuant to the original allocation of educational FM stations, the number of these stations have consistently grown over the years. As of January, 1972, about 72% of the FM educational stations were licensed to colleges and universities, 17% to local boards of education and schools, 6% to churches or religious organizations, and the remainder to community corporations, libraries and other organizations.[6]

Table 1 [7]

THE GROWTH RATE OF EDUCATIONAL AND COMMERCIAL RADIO

The number of stations is as of January 1 of the year noted.

| YEAR | COMMERCIAL | | NON COMMERCIAL |
|---|---|---|---|
| | AM | FM | FM |
| 1945 | 884 | 46 | 0 |
| 1950 | 2086 | 733 | 48 |
| 1955 | 2669 | 552 | 122 |
| 1960 | 3456 | 673 | 162 |
| 1965 | 4012 | 1270 | 255 |
| 1966 | 4050 | 1446 | 269 |
| 1967 | 4117 | 1631 | 299 |
| 1968 | 4171 | 1779 | 326 |
| 1969 | 4236 | 1944 | 362 |
| 1970 | 4319 | 2184 | 396 |
| 1971 | 4323 | 2196 | 440 |
| 1972 | 4355 | 2304 | 479 |
| 1973 | 4393 | 2482 | 625 |
| 1974 | 4422 | 2605 | 711 |
| 1975 | 4432 | 2636 | 717 |
| 1976 | 4463 | 2767 | 804 |
| 1977 | 4497 | 2873 | 870 |

OVERVIEW OF INSTRUCTIONAL RADIO PROGRAMMING

There are several major cities, and in some mid-western states, notably Wisconsin, which have used instructional radio programming extensively for several decades. In addition to U.S. instructional radio use, countries such as Tanzania, Nicaragua, and Great Britain have also used instructional radio as a classroom teaching method.

Radio is far less expensive than other media and both production and listening can be done anywhere. Recording of audio materials is easy and economical. Equipment is simple to handle and the skills necessary for good production can be readily learned. Moreover, radio does not prevent production imagination or innovation in program development. It, in fact, encourages the use of imagination to verbally represent and communicate ideas to the listening audience. Radio is economical in its use of spectrum space and power, and even more impressive is its capability of transmitting several programs simultaneously to different listeners in any imaginable configuration.

International use of instructional radio: Educational radio is also widely used on an international level. Underdeveloped nations such as Tanzania and Nicaragua are using radio as a mass medium for instructional classroom programming.[8, 9]

The Nicaraguan program proved to be a successful and popular educational project. The Radio Mathematics Project was funded by the Agency for International Development to design, implement, and evaluate a system for teaching primary-grade mathematics by radio. The program was developed and coordinated through the efforts of the Nicaraguan government, and education specialists

from the United States and Nicaragua. In July, 1974, the project in Nicaragua began with a series of radio presentations, each followed by twenty minutes of teacher-directed activities. No textbooks were used but a worksheet followed the broadcasts which was used as a classroom activity. The teacher would question students on information from the radio broadcast and the students answered orally. In addition to the worksheet activity, songs and games were used to help the students learn the material.

The United Republic of Tanzania also produced a series of instructional radio programs. A combination of educational objectives and theory, and radio production provided an adult instructional radio series which proved to be highly effective. A group study method was selected for the Tanzanian instructional radio broadcasts which was based on the theory that adults are more motivated to learn when they are actively involved. Groups of approximately 12 adults and a group adviser followed the pattern of reading, listening, discussing, decision making, and action. The instructional materials used consisted of books, adviser's manuals, posters, and flip-over sets. The radio programs in this case were used as a supplement or a focal point from which all the other group activities were centered. The use of radio broadcasts constituted an inexpensive, effective, and popular method of serving the country's commitment to rural education.

Other nations such as Great Britain have also used radio as an instructional method. Education has been a significant

preoccupation of the British Broadcasting Company's (BBC) Local Radio since its outset in 1967.[10] Several objectives which have been set as long term goals for the BBC are good examples of incorporating education theory and development with quality radio production. First, there is an educator on every station's staff. Five hundred series a year involving 4000 various programs are offered. Audiences are large and education efforts are still growing. Second, there is a partnership between education and broadcasting. Teachers work with stations and stations cooperate with teacher training institutions and the Teacher's Centers. Third, local programming dominates. The School Broadcasting Council for the United Kingdom vests responsibility for programming in Local Education Panels; local needs are assessed and programs directed at them. Fourth, benefits to the classroom derive from bringing voices from the community to the students, by allowing children to express their opinions on familiar topics, and by showing students the outside world. Fifth, adult education is served because students are attracted to programs of which they were previously unaware. All in all, the BBC Local Radio effort helps technology to serve education. It is accessible to the public, blurs the distinction between producer and user, and provides the belief that radio is a facility to be used by the community.

As a consequence of the BBC's commitment to educational radio, the Open University of Great Britain has cooperatively developed a series of courses centered around radio instruction.[11] The Open University has roughly 45,000 students enrolled in classes which often results in overcrowded classes. Therefore,

the university relies heavily on broadcasting as a mode of instruction.

An example of a radio instructed course is a course on the management and administration of British public education systems which was offered through the University. The classroom series included radio dramatizations which were accompanied by broadcast notes and a corresponding text. Radio 15, "Caught in the Net," was designed to dramatize a simple decision model involving human interaction. The program was evaluated by student questionnaires, interviews, and group discussions. The evaluation results revealed that radio drama was an enjoyable and positive learning experience for many students. Radio provided a low-cost and useful resource for presenting complex material and a majority of the students approved its educational use. Criticisms of the course included dissatisfaction with the directions of the entertainment element of the program, difficulty in identifying particular characters and allocating viewpoints to the character voices, and the general opposition to use of drama for educational purposes.

Instructional radio programming in the United States: The increased amount of preparation time for television productions and publicity on the success and effectiveness of educational television have overshadowed the use of educational radio. Educational television has been effective because of its successful combination of education theory and good production. Radio can accomplish the same objectives by the realization of the same ingredients. However, radio programs designed for classroom use have not been educational radio's main function in this country

up to now.

A large number of educational radio stations have come into existence either as a training operation for radio broadcasting classes or as part of the university extension information broadcast procedure to carry resources of an educational institution to people of the state. However, the uses of educational radio are of increasing interest to stations as the station's management begin to grasp radio's effectiveness as an instructional medium and to realize the relatively low cost involved in educational program production.

Audience oriented programming: Although the interest in educational radio is increasing, the current perspective most educational radio personnel hold regarding radio is oriented towards broadcasting as an audience service rather than to educational objectives, and how the medium may help to attain them.

As an example of audience oriented broadcasting, radio station WOSU, a public radio station in Ohio, produces an award winning panel discussion program, "Access: Current Issues". Radio station WOSU broadcasts to some 50,000 people at the Ohio State University and to the general public who are interested in public format programs such as "Access". The weekly call-in program consists of a panel of experts on topics which are of community interest. Keith D. Smith, Corporation for Public Broadcasting radio projects manager noted that:

> The format of these shows reflects not only a semantic change, but perhaps a change in

> funding sources as well. Also people don't want to be talked at any more. They probably find this type of educational radio a bloody bore. Educational programs that have a format similar to that of the "Access" show are more often effective.[12]

Another example of special audience oriented programs on educational radio includes the establishment of a two way medical and nursing conference by the Albany (NY) Medical College through its FM station, WAMC. In 1971, 72 hospitals participated in WAMC's program and similar systems were in operation in other states, including North Carolina, Wisconsin, Ohio, Utah, and Pennsylvania.[13]

In addition to this form of programming, special interest groups such as the physically blind and handicapped rely on educational radio for news and information programs. Reference circulars are available through the Library of Congress which provide programming information on public radio stations which offer programs designed specifically for this interest group. The Library of Congress also provides audio educational materials for broadcast for blind individuals who cannot read braille. These audio materials are considered an inexpensive and effective means of communication for the handicapped and blind.[14]

Audience oriented radio is one perspective of educational radio programming, but if radio is to take its proper place in the arsnel of electronic learning aids, radio stations will have to acquire or develop a liaison with professionals who know how people learn.

Instructional radio classroom programs:

WHA which broadcasts from the University of Wisconsin in Madison has been highly successful in their classroom educational radio program series. A comprehensive study in January, 1969, on the Wisconsin School of the Air Radio program for elementary schools indicated a high use of radio as an instructional medium. The use of radio and television in all the 2650 elementary schools in Wisconsin showed that the Wisconsin School of the Air program was being used by better than 82% of all classrooms where both TV and radio were available. In addition, the use of radio has slightly increased since the advent of television.[15]

Similarly, the New York City school broadcasting service, a consistent user of the dramatic format in radio instructional broadcasts found that in 1970-71, after 13 years of available television as well as radio for classroom use, the actual figures stood as follows: number of television users--13,544 and number of radio users--21,248.[16]

In addition to these successful programs, radio station KCMW FM, which broadcasts from Central Missouri State University, has successfully produced classroom radio programs for primary school students and adult education students. During 1973, the station ran three district educational programs simultaneously: one for primary school students, one for college level students and a third for an adult education class. In all radio broadcasts, a combination of educational objectives and good radio production resulted in a successful and effective instructional series of programs.

The primary school program series was developed with three objectives in mind: 1) to help children develop an interest in vocabulary development; 2) to increase interest in language study through the use of a variety of receptive and expressive media, and 3) to promote inter-action between community and school in helping children discover the use of words. The development of this program series was closely monitored by an advisory group of radio personnel, teachers and education consultants. At the conclusion of the children's broadcast series, Carolyn Kindrick, Power of Words (POW) series chairperson noted:

> Teachers became aware of some of the possibilities of radio as a medium for the classroom. There was, of course, much more in the overall concept of POW than the broadcasts, like special in-class readings and other procedures aimed at vocabulary development. We found that using radio gave us an added dimension, allowed us to do somethings that we might not have been able to do otherwise.[17]

The program development procedures used in the children's series was similar to the procedures used in producing the college and adult education series. The approach to instructional radio involves much more than simply recording classroom lectures and playing them back to the students. Don Connelly, KCMW-FM Instructional Coordinator descrided their approach to instructional radio as:

> We strive to create as interesting a program as possible for each lesson. We set each program up around a basic programmed learning sequence and keep it short and to the point. The average time is about 20 minutes with a 3 minute break ... We try to encourage creativity and variety so that each program is something new to the student.[18]

In many ways the "On Air" project attempted to capture the spirit of the special audience oriented programming and provide a programmed sequence of audio tapes which would both inform and stimulate the college level student. This is one audience which has received little attention from instructional radio specialists. In order to fit the relatively specialized content of an upper division college level course into the 30 minute format a systematic instructional design procedure was necessary. This procedure is described in the following chapter.

## FOOTNOTES

1. Library of Congress, Directory of Local Radio Services for the Blind and Physically Handicapped (Bethesda, Md: ERIC Document Reproduction Services, ED 127 977, May 1976).

2. Broadcasting Yearbook, section A (Washington D. C. 1978) p. A-2.

3. Federal Communications Commission, Educational Radio (Washington D.C., Information Report R-21-8, 1972), p. 13.

4. Land Associates, Inc., "The Hidden Medium: A Status Report on Educational Radio in the United States," in Cooperative Program Tape Networks in Noncommercial Radio by Peter Norgren (Bethesda, Md: ERIC Document Reproduction Services, ED 115 254, December 1975) p. 18.

5. Federal Communications Commission, Educational Radio (Washington D.C., Information Report R-21-8, 1972), p. 2.

6. Ibid, p. 5.

7. Broadcasting Yearbook, section A (Washington D.C., 1978), p. A-6.

8. Searle, Barbara, The Nicaragua Radio Mathematics Project Bethesda, Md: ERIC Document Reproduction Services, ED 112 887, 1975).

9. Grenholm, Lenhart H., Radio Study Group Campaigns in the United Republic of Tanzania (Bethesda, Md: ERIC Document Reproduction Services, ED 122 755, 1973).

10. Bethall, Hal, Education and BBC Radio: A Combined Operation (Bethesda, Md: ERIC Document Reproduction Services, ED 086 155, 1972).

11. Gallagher, Margaret, Broadcast Evaluation Report Number Eight: Decision-Making in British Education Systems "Caught in the Net" (Bethesda, Md: ERIC Document Reproduction Services, ED 119 671, 1975).

12. Huerta, Loretta K., "Audio Technology: WOSU Radio-Talking Success," Educational Broadcasting, November/December 1976, p. 36.

13. Federal Communications Commission, Educational Radio, (Washington, D.C., Information Report R-21-B, 1972) p. 6.

14. Corporation for Public Broadcasting, Radio Information Services for the Print Handicapped: A Handbook for Local Use (Bethesda, Md: ERIC Document Reproduction Services, ED 129 209, 1975).

15. Hegeman, Dolores A., Report on the Wisconsin School of the Air Radio Survey (Bethesda, Md: ERIC Document Reproduction Services, ED 071 420, 1969).

16. Robertson, James and Yokom, Gerald G., "Educational Radio: The Fifty-year-old Adolescent," ERIC/EBR Annual Review Paper (Bethesda, Md: ERIC Documents Reproduction Services, ED 074 728, April 1973) p. 114.

17. Conners, Jack, "Facility Report: KCMW-FM and CMS-TV." Educational Broadcasting, November/December 1973, p. 20.

18. Ibid. p. 20.

Barrett, Hugh. "Listening to Learn." Adult Education Now (1972): 44-47.

Bethel, Hal. Education and BBC Radio: A Combined Operation. Bethesda, MD: ERIC Document Reproduction Services, ED 081 208, 1972.

Borton, Terry and Belasco, Leonard. "The Story of Dual Audio TV." Public Telecommunications Review (March/April 1975) 28-31.

Broadcasting Yearbook. (1978) A-1-A-7.

Cliff, Charles and Lee, Varnell. Non-Commercial FM: Profiles of Service. Bethesda, Md.: ERIC Document Reproduction Services, ED 147 911, November 1977).

Connors, Jack. "Facility Report: KCMW-FM and CMS-TV." Educational Broadcasting. (November/December 1973) 18-23.

Corporation for Public Broadcasting. Radio Information Services for the Print Handicapped: A Handbook for Local Use. ERIC Document Reproduction Services, ED 129 209, 1975).

Dempsey, Augustine. "WABE-FM." Educational Broadcasting 7 (November/December 1974) 29-32.

Early, L.F. FM Radio: An Oral Communication Project for Migrants in Palm Beach County. Bethesda, Md: ERIC Document Reproduction Services, ED 061 739, April 1972).

Federal Communications Commision. Educational Radio. Information Report R-21-8, Washington D.C., 1972.

Gallagher, Margaret. Broadcast Evaluation Report Number 8: Decision-Making in British Education Systems "Caught in the Net." Bethesda, Md: Eric Document Reproduction Services, ED 119 671, 1975.

Garfinkel, Alan. "Teaching Languages via Radio: "A Review of Resources." Modern Language Journal. (March 1972) 159-163.

Grenholm, Lenhart H. Radio Study Group Campaigns in the United Republic of Tanzania. Bethesda, Md: ERIC Document Reproduction Services, ED 122 755, 1975.

Guarrera, Sebastino. "Active Participation of Halian Pupils in School Radio Programs." EBU Review (March 1972) 10-14.

Hegeman, Dolores A. Report on the Wisconsin School of the Air Radio Survey. Bethesda, Md: ERIC Document Reproduction Services, ED 071 420, 1969.

Huerta, Loretta K. "Audio Technology: WOSU Radio-Talking Success." Educational Broadcasting. (November/December 1976) 19-21, 36-37.

Japan Broadcasting Company. Educational Broadcasts of NHK. Bethesda, Md: ERIC Document Reproduction Services, ED 136 811, 1977.

Kassam, Yusuf D. "Towards Mass Adult Education in Tanzania: The Rationale for Radio Study Group Campaigns." Literacy Discussion. (Spring 1975) 79-94.

Library of Congress. Directory of Local Radio Services for the the Blind and Physically Handicapped. Bethesda, Md.: ERIC Document Reproduction Services, ED 127 977, May 1976).

McAnany, Emile G. Radio's Role in Development: Five Strategies of Use. Bethesda, Md.: ERIC Documentation Reproduction Services, ED 086 155, September 1973.

Mead, John. "The Use of Radio in the Open University's Multi-Media Educational System." Educational Broadcasting International. (March 1976) 16-20.

Nordgren, Peter D. Cooperative Program Tape Networks in Non-commercial Radio. Bethesda, Md.: ERIC Documentation Reproduction Services, ED 115 254, December 1975.

Robertson, James and Yokum, Gerald G. "Educational Radio: The Fifty-year-old Adolescent" ERIC/EBR Annual Review Paper. Bethesda, Md.: ERIC Document Reproduction Services, ED 074 728, April 1973.

Searle, Barbara. The Nicaragua Radio Mathematics Project. Bethesda, Md.: Eric Document Reproduction Services, ED 122 755, 1975.

Stevens, Jenny. "The BBC Adult Literacy Project." Convergence: An International Journal of Adult Education (10, 1, 1977) 20-28.

Theroux, James. "A New Context for Broadcaster Training." Educational Broadcasting International. (December 1976) 158-159.

## CHAPTER II

## THE MESSAGE DESIGN OF THE PROGRAMS

### The Message Design Model

The model by which the design decisions for the twenty one-half hour programs were made has been reported in greater detail elsewhere[1-6]. It has been commonly referred to as the "Marsh Model", only the essence of that model will be described here. Some refinements have been made in the Marsh Model since the present study was undertaken, but the model will be described as it existed at the outset of this study.

This model holds that the optimal duration of a message is a function of the ratio: information load/ message complexity. In other words, the optimal time of a message (which is the "saddle-point" between economy and effectiveness) can be reduced either by reducing the information load of the message or by increasing the message complexity. Both of these concepts require further definition.

Information load is quantified in terms of "chunks" rather than in information theory's "bits". George Miller's concept of "information chunks" has been expanded somewhat and operationalized for use in this model, but in essence the concepts are very similar.[7] A chunk, as used here, refers to the terminal division point of an

idea at which abstraction yields to concreteness. In other words, a chunk is identified at the smallest subdivision of an idea at which supporting materials are added to amplify that fragment of the idea rather than continuing the subdivision or leaving the fragment unamplified. Miller stresses that it is the number of chunks, not the size of the chunks that is critical for comprehension and memory. That is, a simple subpoint can be supported with one example, or it may be supported with two examples, a quotation, a definition, and a paraphrase, etc. In either case it would be only one chunk.

The concept of message complexity takes into account both the characteristics of the physical signal and the human decoder. Our factor analytic studies have identified two complexity elements related to the signal: (diversity and density); and two related to the psychological "set" factors (engagement and tension). These four factors were used to define message complexity in the present study. Each requires further definition.

Diversity. Signal diversity refers to the number of sensory systems stimulated by a message, as well as the degree of variety within the audio and the visual systems. It attempts to estimate "how busy the message is." A previous study established visual variety as a significant predictor of diversity. That study did not establish audio-variety as significant, but analytic rationale

justifies its inclusion.

Density. Signal density is a measure of "how heavy the message is." The three dimensions which best represent conceptually what is intended by this component (all of which produced high factor loadings) are: rate of change, redundancy, and structure. Other dimensions were also significant, but these appear to be the best index of the concept.

Engagement. This factor measures the degree to which the receiver is invited to participate or is excluded from participating with the source in developing the message. The dimensions of engagement are reward and involvement.

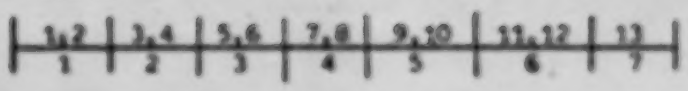
Tension. The tension component of complexity is theoretically related to intended muscular response of the receiver involving both striped and smooth muscles. The best indices of this factor resulting from our factor analysis studies are shock and suspense.

Figure 1 specifies how message complexity is scaled using these dimensions. It should be clear that this model provides the basis for specifying message profiles that differ in known ways and amounts from one another. This function is critical for an experiment of the sort undertaken here.

Figure 1

MESSAGE COMPLEXITY SCALE

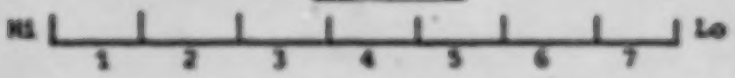
1. DIVERSITY



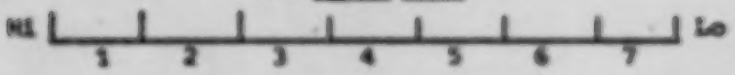

Diversity scale rating _____

2. DENSITY

(a) Redundancy

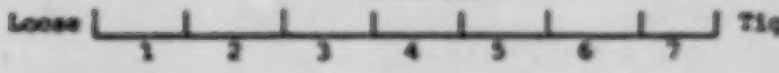



(b) Slack Time




Density scale rating _____

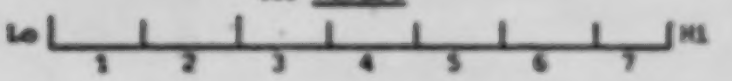
(c) Structure




$$\frac{a + b + c}{3}$$

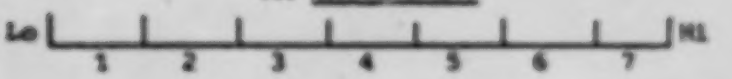
3. Engagement

(d) Reward




Temperature scale rating _____

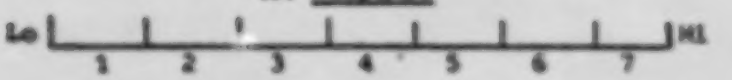
(e) Involvement




$$\frac{d + e}{2}$$

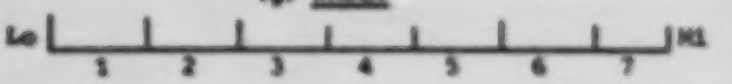
4. TENSION

(f) Suspense




Tension scale rating _____

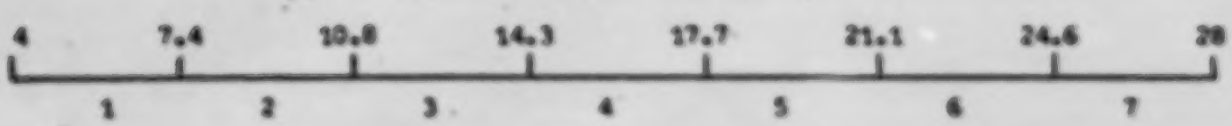
(g) Shock




$$\frac{f + g}{2}$$

COMPLEXITY TOTAL

(ENTER COMPLEXITY TOTAL HERE)




(READ COMPLEXITY SCALE RATING HERE)

Assignment of Programs to Message Profiles and Formats

The Communication Studies 100A course (Survey of Communication Studies) was compressed to twenty program topics, and they were organized into the exiting six units of the course. They exhaust, for all practical purposes, the substance of that course although one or more fifty minute periods are typically devoted to each program topic in the classroom rendition. These program topics include:

Unit I. Introduction and Background
Prog. # 1 Overview of series
# 2 Look into the future
# 3 New look into the present
# 4 A long look into the past

II. Information Processing and Management
# 5 Information overload
# 6 Information processing
# 7 Reducing reality to a manageable size

III. Codes for Communicating
# 8 Symbolic systems: The great harmonizers
# 9 Semantics: The mischief of language
#10 Message with design: Filling the slots with gold

IV. Interpersonal Binding
#11 Dyad Dynamics
#12 Attitudes and beliefs
#13 Value systems: our unique goggles

V. Structured Communication
#14 Basic networks
#15 Complex organizational communication

VI. Paradigms of Inquiry
#16 Facts and Inferences
#17 Reasoning models
#18 Critical Research
#19 Empirical Research
#20 Consciousness Integration

With the program topics identified, it was then possible to assign them to complexity profiles. A previous study (1) had established a medium complexity level as optimal for CSUS students, so accordingly we selected only those combinations that averaged to a medium complexity value. Programs 1 and 20 were introductive and conclusive for the series, so they were assigned to the profiles that equated the complexity factors at a medium level. All other programs were randomly assigned to one of six complexity profiles, thus providing three programs for each profile. The profiles were:

| DIV | DEN | ENG | TEN | Program Topics |
|---|---|---|---|---|
| Med | Med | Med | Med | (2) |
| Lo | Lo | Hi | Hi | (3) |
| Lo | Hi | Lo | Hi | (3) |
| Lo | Hi | Hi | Lo | (3) |
| Hi | Lo | Lo | Hi | (3) |
| Hi | Lo | Hi | Lo | (3) |
| Hi | Hi | Lo | Lo | (3) |
| | | | | (20) |

This design provided exhaustive and balanced conditions with replications for the medium complexity possibilities. The conditions of control, randomization, and replication contributed to a strong experimental design.

Finally, ten program formats were selected; this allowed each format to be used twice to increase replication characteristics of the design. The first and last programs were arbitrarily assigned to the "variety show" format because of the special requirements of the introductory and concluding programs. The other were randomly assigned to the remaining formats; namely:

A. Lecture (Didactic)
   1. Classification
   2. Explanation
   3. Demonstration

B. Dialogue (Dialectic)
   1. Socratic
   2. Interview
   3. Panel

C. Creative (Poetic)
   1. Prose and poetry reading
   2. Dramatization
   3. Narrative Story

The program topics described above comprised what was called the "main event" of the program targeted at 19 minutes. The other features of program format were relatively constant for each program with exceptions noted below. The common program format was:

| | |
|---|---|
| Introduction | 2 minutes |
| Main event | 19 minutes |
| Spot light feature | 3 minutes |
| Concept review | 3 minutes |
| Close and announcements | 1 minute |
| | 28 minutes |

The "spot-light" features helped to preserve the desired magazine format and had the impact of breaking up the program block for variety's sake, yet retaining

relevance to the program topic. In three-minute blocks, they introduced personalities, commentaries, or activities related to the main event, but with enough of a departure to provide programmatic rhythm and novelty.

The "concept review" features, typically in a simulated quiz show or game show format, provided a thorough review of the main concepts developed in the main events. They were designed to maximize redundancy, engagement, and levity.

This magazine format was maintained throughout the series with two or three exceptions where we determined that more time was required for the main event for these particular topics.

Operational Specification of Message Complexity

We established a set of guidelines to aid the message designer in determining high, medium, and low values for the message complexity elements. These guidelines were created within the complexity limitations for radio presentation. The guidelines were referred to during the formulation of each "message prescription", and even though there were slight deviations from the guidelines from time to time to accommodate special programmatic limitations or demands, a panel of critics agreed in each case that the deviations did not invalidate the ratings of these complexity profiles. These guidelines follow:

utility, significance, value, or importance of the information presented. Mix the invitation of examples and conclusions with explicit presentations. Sometimes refer to the study guide or student's notes. Make a moderate attempt to identify with listener's values and interests.

Low engagement instructions included: Seldom if ever praise or encourage the listener. Make no explicit invitation to visualize. Use highly non-immediate language. Seldom mention the utility, significance, value, or importance of the concepts. Provide all examples; draw all conclusions. Seldom or never request activity other than listening. Make no attempts to identify with the listeners.

Tension.

High tension was created by these directions: Create suspense by announcing plans and then delaying (e.g. "But first, let's consider..."). Interrupt the thought, then return to complete it. Announce that the solution will be withheld for a while. Introduce unexpected elements of language, sound, music, etc. Create or describe discomfort, dis-contentment, concern, or anxiety. Create conflicts vicariously or actually. Use loud or cacophonious sounds or music.

Medium tension mixed and moderated the extremes of high and low tension.

Low tension instructions were: Do not build expectations. Complete thoughts with expediency.

Minimize the time between problem and solution or hope of a solution. Avoid shocks--prepare the listeners for changes. Stress pleasantness, ease, confidence, etc. Resolve apparent inconsistencies or conflicts. Use soft harmoneous, nondescript music.

Box Outlines

To facilitate blocking out the content of each program and to keep that content within the experimental design requirements, blank "box outline" forms were reproduced for each of the three density levels. The instructor-designer selected the critical information from each topic area and arranged it in "key word" format on the box outlines and then supplied suggestions for appropriate supporting material. The project directors both approved the outlines before further design work was done. Figures 2, 3, and 4 show the blank forms employed. Since the outlines themselves were working sheets, and since the program outlines appear in sentence-outline form in the "message prescriptions", the box outlines have not been included in this report.

Message Prescriptions

For this phase of the production planning the instructor-designer wrote a detailed message prescription for each program. It specified the profile requirements, assigned a writing style, and included a sentence outline

Diversity. Diversity levels were established by controlling the number of diversity elements included in the main event. High diversity clustered around 12 elements, medium diversity clustered around 8 elements, and low diversity around 4 elements. The elements included: a single voice, multiple voices, simultaneous voices, music present, varied musical styles, solo music, orchestrated music, imitative sound effects, abstract sound effects (e.g. electronic "wow", speech compression), poetry present, varied verbal supports, choral responses, laughter, crying, audience response (e.g. applause).

Density. High density was characterized by the following instructions: Do not restate or paraphrase points. Use one or two word verbal transitions (e.g. next, another example, etc.). Use two supports per chunk. More supports from general to specific and/or from figurative to literal. Use overview and summary of point structure. Do not pause at transition points. Use ten chunks per message.

Medium density was established by these instructions: Either restate or paraphrase each point. Use short-phrase transitions (e.g. "Moving on to the next consideration..."). Use four supports per chunk. Move four of the chunks from general to specific or from figurative to literal; randomize the supports in the remaining three chunks. Use either an overview or a summary of the point structure. Pause at one-half of

the transition points from 3-5 seconds. Use seven chunks per message.

Low density was defined by these directions: Both restate and paraphrase each point and consider this treatment as the use of two supports. Use elaborate transitions (i.e., two or more sentences). Use six supports per chunk. Randomize all supports. Use neither overview nor summary of point structure. Pause 3-5 seconds at all transition points. Use four chunks per message.

Engagement.

High engagement instructions were: Use seven or eight remarks of praise or encouragement directed toward the receiver. Five or six times invite the listeners to visualize what is being said. Avoid non-immediacy language. Frequently stress the utility, significance, value, and importance of the information being presented. Frequently invite the listeners to provide their own examples and use enthymemes. Refer often to the study guide, handouts, or the listener's notes. Identify with thelistener's values, interests, and experiences.

Medium engagement instructions were: Offer praise or encouragement about four times during the message. Invite visualization two or three times. Make moderate use of non-immediacy language. Sometimes mention

Figure 2

# LO Density Message (x = 3-5 sec. pause)

C.E.

(No overview; No Summary)

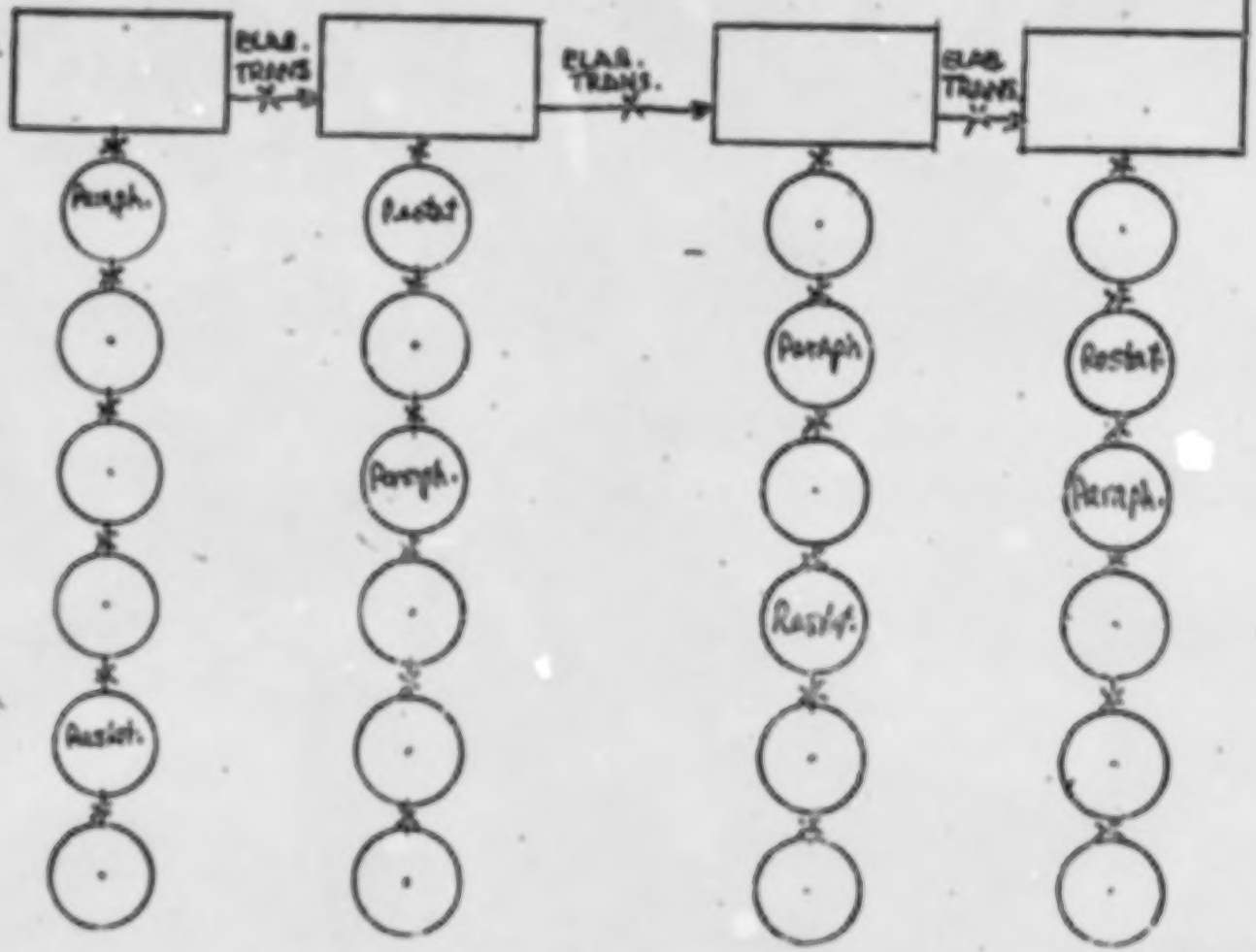


Figure 3

# MEDIUM DENSITY MESSAGE

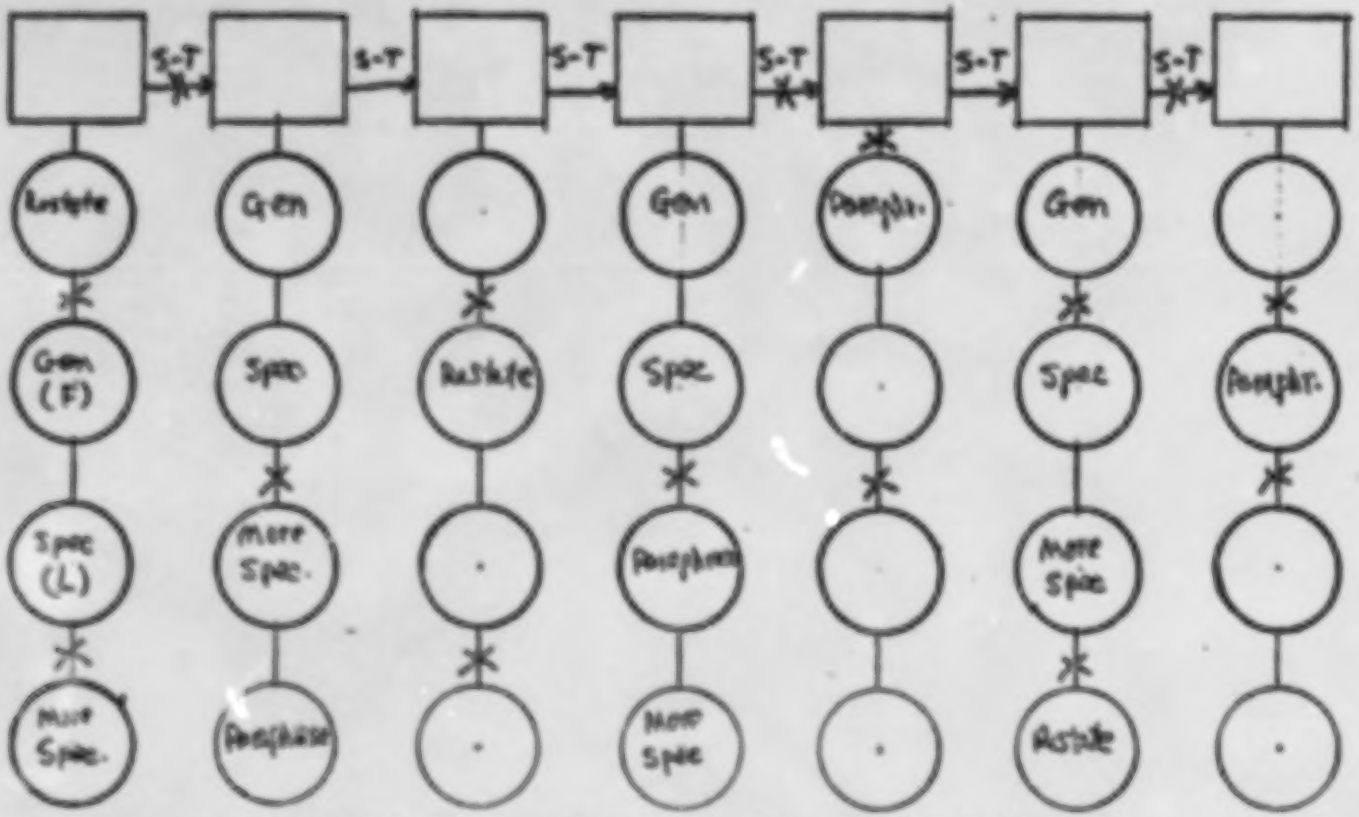
T = I/D

(X = 3 Sec. - 5 Sec. pause)

(S-T = Short transition)

C.E.

Overview



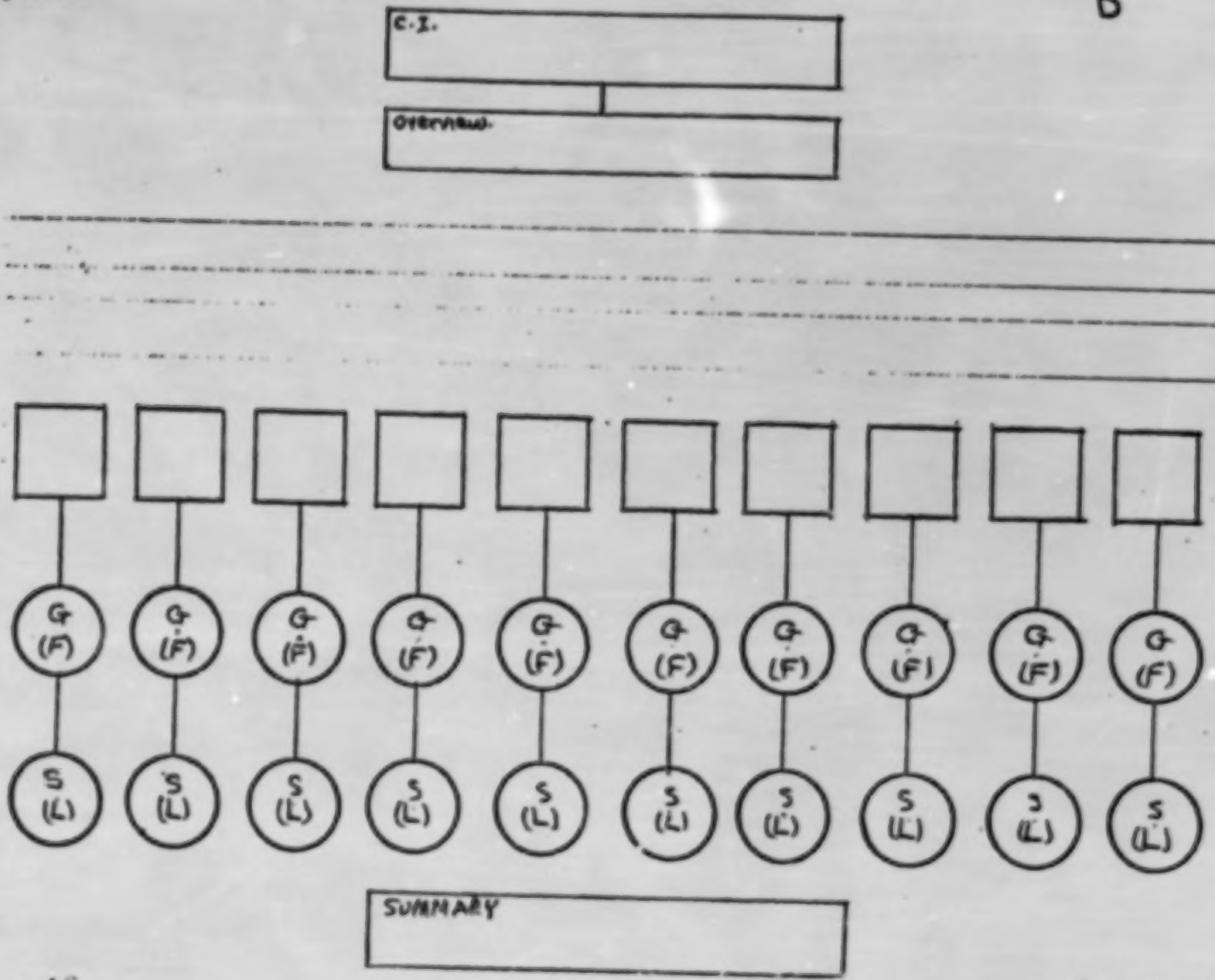

40

41

Figure 4

# HIGH DENSITY MESSAGE

T = I/D






Project CS 100A (Radio)
DOM. 8-21-77

for the message. These prescriptions were essential to the coordination of the writing, evaluation, and production of the programs. Selected message prescriptions can be found in Appendix F.

VI. Script Writing and Post-production Editing

Fourteen of the programs were scripted, and six were edited from readings or from panels and interviews. Of the fourteen for which scripts were written, nine were written by the instructor designer and five were written by students selected from a creative writing class. The designer met in a group with the student writers and defined in detail the technical requirements of the model and the prescriptions. Additionally each writer met individually with the instructor-designer at intervals during the actual writing. The students augmented the instructor's detailed subject-matter briefing by referring to selected readings. Some students had to re-write after the first effort and other's submitted their scripts for minor revisions by the instructor-designer. The student writers were given credit under a "special-problems" course classification; all worked reliably and enthusiastically.

VII. Direction and Production

The scripts and message prescriptions were given over to an employed student production manager who,

working through both the campus production facilities and a private production company, supervised and coordinated the productions. The production manager had freedom to direct the production creatively within the specific constraints of the prescriptions and scripts. Any deviation from those documents had to be approved by one of the project directors.

The production manager held auditions for student talent, selected and cast the talent, and coached and rehearsed the productions. Some of the "talent" were enlisted from the faculty to perform in programs within their subject-matter expertise.

Generally, the project directors were well satisfied with the quality of the productions. Our experience brought to attention some matters that could lead to greater efficiency in future operations if avoided. Most notable were these:

- Some uncertainty in both scripts and prescriptions could have been prevented by making more specific production notes and directions.
- Communication would have been facilitated among production coordinator, writers, and designer through regularly scheduled meetings.
- The writer and/or designer should have been present at rehearsals for consultation.
- More specific notes on the use of sound effects and music were requested by the producers.
- Writers should have been more carefully coached in "writing for the ear" as radio format requires.

- The quality of student writers might have been standardized somewhat by using a standard writing assignment in the selection process.

- When circumstances permit, at least one-half of the scripts should be written before production begins in order to make economic use of facilities.

In this study, we were interested in seeing whether student production coordinators could rely primarily upon message prescriptions and scripts to produce effective instructional radio programs. We are satisfied that they can. Given a professional staff, the quality might be enhanced, but knowing that successful material can be produced with the economy of student-dominated productions is worthy of note. Post-hoc analyses comparing the effectiveness of student-written and instructor-written scripts, as well as scripted and non-scripted programs are reported later.

## FOOTNOTES

1. Patrick O. Marsh, "Final Report of the U-Curve Plotting Project", a study funded through the California State University and Colleges Office of the Chancellor: New Program Development and Evaluation's Fund for Innovation and Improvement, 1973.

2. Patrick O. Marsh and Albert C. Kowitz, "Toward a Model of Message Complexity", A paper presented at the Western Speech-Communication Association Annual Convention in Seattle, Washington, November, 1975.

3. Patrick O. Marsh, "How to Design an Instructional Message", a slide-tape presentation (60 minutes) available at the Media Services Center of the CSU, Sacramento Library, 1977.

4. Patrick O. Marsh, "Toward a Theory of Message Design", a paper prepared for the NSF Chautauqua-Type Short Course W-13: Theories of Perception: Conceptual, Theoretical, Methodological and Experimental Advances and Problems, Stanford University, 1978.

5. Patrick O. Marsh, "The Instructional Message: A Theoretical Perspective", submitted to Educational Communications and Technology Journal (formerly Audio-Visual Communication Review), 1978.

6. Patrick O. Marsh, "Maybe the Medium is the Message, But the Maximum is the Message Design", Future Talk, Office of the Chancellor -- The California State University and Colleges, No. 19, Winter 1978, pp. 1-3.

7. George A. Miller, "The Magical Number Seven Plus or Minus Two: Some Limits on our Capacity for Processing Information", The Psychology of Communication: Seven Essays (George A. Miller, ed.), Baltimore: Penguin Books, Inc.

## CHAPTER III

## BUDGET

The primary purpose of this section is to describe the specific expenditure pattern which characterized the project. As with all projects of this nature, the actual expenditures deviated somewhat from the projected budget categories. A detailed fiscal analysis is not presented here since the actual expenditures very closely paralleled the director's initial projects and all financial transactions were routed through the normal purchasing or contractual procedures of CSUS. The emphasis, therefore, will be on the project's use of the specified budget categories.

In addition to the restrictions on the scope of this analysis noted above, there will be a concentration on the project activities during the second six months of this grant period. Fiscal activities during the first six months of the project are contained in the Interim Report (Appendix B).

The trends which were noted in the interim report continued to be a factor during the second phase of the project. Specifically, there was a continued utilization of student assistants who were either paid or who worked for academic units. The details of this category of expense will be presented later in the report. The second trend, which actually accelerated during the second six months of the project, was the accumulation of a surplus in several budget categories. Third, the project, even though it involved a large-scale production, did not purchase any hardware; it utilized

either available production systems or studio facilities. This was consistent with the directors' initial expectations and allowed for the concentration of resources on the software dimension of the program production.

The project owes a great deal to the many students who, either for pay or credit units, worked on the production and implementation of the audio modules. In terms of actual expenditures, most of the student assistant funds were utilized for direct production assistance and talent. There were four students who had major roles in the production of the audio modules. One student was responsible for coordinating all the production scheduling and worked on the actual creation of several portions of the modules. A second student worked on all the clerical jobs associated with the project (typing of scripts, contract drafts, study guides for the audio tapes, talent release forms, etc.). Two additional students recruited, organized, and rehearsed all of the talent used in the productions. The production assistant was paid through grant funds; the clerical assistant was paid by the Department of Communication Studies. The talent coordinators received field work units for their efforts. There were approximately 30 students who served as talent for the project. Some of these students received units, some volunteered their time, while others were paid out of grant funds. All undergraduate assistants were paid $3.00 per hour. The total cost of student assistants and talent to the grant was $1,550.00. It was the policy of the project to pay student talent for four hours of work for each performance, including rehearsal. This was approximately half the time students actually spent working on their parts. During May and June, a graduate student, who was

also a professional typist, and two graduate research assistants were hired by the project. The typist prepared several sections of the final report; the first research assistant did extensive bibliographic work, draft writing for the final report, as well as assisted in the data analysis not covered by the contracted evaluative services. The second graduate assistant served as a reader for the control and experimental groups written assignments. This allowed for uniform judging so that these groups could be statistically compared (see Appendix C). These additional activities resulted in expenditures of $1,260.00, bringing the total expenditures of $2,810.00 for student assistance over the grant period.

The funds actually expended in the student assistant category were 100% over the estimation of need for this area. This resulted from an attempt to decentralize some of the administrative and research components of the project as well as the necessity to make rather quick decisions because of an unexpected budget surplus. It seems appropriate to comment on the accumulation of this surplus since it played a rather substantial part in the fiscal decision making process during the last half of the project. As noted in the interim report, the area of faculty support was originally budgeted at .75 FTEF years at assistant professor step 3 ($11,718), with an additional 20% benefits ($2,409). This allocation was raised to 1.00 FTEF during the Spring semester because of the need for additional release time for both of the project's directors. This increase was possible for a rather simple reason--although the reimbursement allocation was as given above, the replacement faculty were part-time and thus were paid at a lower salary scale than projected. The administration of the personnel segments of

the budget were handled through the Communication Studies Department and neither project director was aware of the surplus until late in the Spring. At that time, it became apparent that there would be a total surplus of approximately $6,000. As with all innovative projects, part of the compensation is derived from the privilege of working on a project which one feels can contribute to the improvement of instruction. However, early clarification of the rules governing the use of personnel surpluses would have allowed maximizing the use of graduate assistance and facilitated the completion of project productions, evaluation and follow-up activities in a timely fashion.

After payment for the additional graduate assistants there was still an additional $4,600.00 in the project's budget. After consultation with the grant officer, $620.00 of this money was used to have 20 dubs made of each of the twenty programs. These dubs were placed in the library media services center so that the mediated course could be fully implemented by Fall, 1978. The allocation of the last $4,000.00 was made in June and consisted of transferring this money to the CSUS Center for Instructional Media.

A two-pronged production effort was planned; the first part necessitated using outside producers. The reasons for this were twofold. First, it gave the directors greater production capabilities. Secondly, independent producers would be better able to meet the severe time constraints in getting our initial programs on the air. In September, the second level of production was planned. The CSUS Center for Instructional Media (CIM) was requested to provide "level B" assistance; i.e., technical assistance for a project which was in direct support of instruction. From an

examination of CIM's policies and procedures, and after consultation with the associate director, the Center agreed to undertake the technical assistance necessary to produce the in-house tapes. It was the understanding of both project directors that this was the type of activity for which CIM is funded and thus no charges other than materials would accrue from their assistance. For reasons which are not clear to either project director, the memo itemizing the costs which the Center incurred was sent to the project directors, as well as carbon copies to several University Administrators. This memo is included in Appendix D. Although there is a no charge-back policy in effect regarding the Center's services, the remainder of the project's funds were transferred to this unit in consideration of their services to the project. It should be noted that the Center's staff were most cooperative and competent--a large measure of the project's success resulted from the high quality of assistance and direction provided by Richard Osborn, the staff person who was assigned to the project.

The above narrative provides a description of the expenditure pattern of the project. The contracted services which were outlined in the grant and interim report were executed. As shown in Appendix C (third party evaluation) and in Appendix D, which contains all executed contracts. Further information can be obtained from either the project directors or the monthly AEL Transaction reports on file at CSUS.

## CHAPTER IV

## IMPLEMENTATION

Since the previous section presents the main profile concerning the production of the audio tapes, this part of the report will concentrate on how they were utilized and field tested. It is recommended that the material in this section be carefully assimilated before one attempts to interpret the various statistical analyses presented in the Evaluation Report.

As noted in the original grant proposal, the goal of this project was to mediate a fully developed course and to compare the cognitive and affective effects of mediated and lecture versions of this course. Audio tape was selected as the means of accomplishing this mediation, primarily because the medium is so flexible and offers many possibilities for incorporation into various types of learning systems. One of the key concerns of the project was the broadcast possibilities of the audio modules as compared to their potential use with components of a demand access auto-tutorial system.

In order to accomplish this comparison, two experimental sections of CS 100A were designated for Spring, 1978, semester. During the previous semester, approval was obtained from the Department's Curriculum Committee to alter the normal lecture structure of CS 100A for the purpose of this grant. One of the experimental groups was to listen only to the radio broadcasts and meet

three times during the semester for discussion and testing. The other group was to use the audio materials as part of a self-paced learning sequence. Two additional classes were to be included in the experiment as controls. One of the control classes was to be taught by Professor Marsh, the designer of the mediated modules. The other class was to be taught by Professor Cobb who, along with Professor Marsh, developed the course. The format for both these sections was lectures and the rationale for selecting these two professors was simply to provide content similarity for all the sections. All four sections shared the same instructional objectives and, of course, used the same texts and tests.

The campus radio station KERS-FM agreed to broadcast the programs Monday through Friday, 12:30 - 1:00 p.m.; and Tuesday and Thursday, 6:30 - 7:00 p.m. These times represented a compromise between the desire to reach maximum audience and the constraints of KERS programming time and staff. Since the semester was 15 weeks long and there were 20 audio programs, the schedule was staggered so that each program was heard six times (three times during the day and three times during the evening). The schedule of air times is included in Appendix E. For the self-paced sections, copies of the audio tapes were placed in the Media Services Center where the student could listen to the tapes at audio carrels any time during the normal library operating hours.

This was the intended structure going into the Spring semester but proved difficult to implement. The main problem centered around the segregation of the experimental groups into audio versus radio groups. Both groups requested that they be allowed to monitor the radio broadcasts as well as listen to the tapes in the

library. After careful consideration, the directors agreed to this for three reasons. First, the tapes required repeated listening which was possible in the radio sections, but not particularly convenient due to the restrictive broadcast times. Secondly, most of the students were on campus during the day or evening and it was simply more convenient and reasonable for them to listen to the tapes at the library. Third, while many of the students listened to the radio broadcasts while commuting to and from school or work, the reach of the radio station was not adequate for many of the suburban students. Although some of these problems were anticipated, the goal of testing various mediated formats remains one which still needs to be reached. However, the project actually accomplished a full mediation of CS 100A as well as the implementation and field testing of the audio modules. In practice, then, both experimental groups utilized a radio format combined with a demand access auto-tutorial system.

Because of the similarity of the two experimental groups, the actual comparisons made in the evaluation was between both these groups and the two lecture sections. The remainder of this part of the report will deal with the actual structure of the course itself.

CS 100A is a survey of the entire field of communication studies and is structured in a criterion reference fashion. Three multiple choice exams are given during the semester, one of these being a non-comprehensive unit exam at the end of the semester. If the student achieves 70% or better on the exam, it is felt that adequate mastery of the material has been gained and the student has passed the exam. If the student does not pass the

exam, then there are essay type take home exams which can substitute for either of the first two unit exams. However, in order to receive credit for the last exam the student must pass it without a makeup. In addition to these requirements, the student can elect to complete ten one-page papers, each of which analyzes a specific communication concept and one five-page paper which synthesizes these concepts into an integrated paper on communication. These fifteen pages constitute the written requirement and are viewed as a single enterprise. The student elects to take as many exams as well as whether or not to do the concept papers. Incompletes in the course are granted only for exceptional reasons and the student's grade is calculated based on the number of exams successfully passed and whether or not the student successfully completed the written requirement. In order to receive an A, the student must complete all four requirements (3 exams plus the written work); a B requires three completed units, etc.

In reading the evaluation report this information should be kept in mind since many of the cross tabulations are based on categories constructed using 70% as the cutoff level. Given the structure of the course, the reason for this is obvious. One additional item which should be kept in mind regarding the exam scores is that the exams are extremely difficult. Many graduate students who take the course as required background for their work in communication have found the material challenging. This will provide some perspective for examining the number of high exam scores for each test.

The following section deals with some conclusions regarding the success of various design profiles. For a summary of the

project, the reader is referred to the abstract at the beginning of the report and for detailed information is referred to the appendices.

## CHAPTER V

## FINDINGS AND IMPLICATIONS REGARDING THE IMPACT OF COMPLEXITY PROFILE AND PROGRAM FORMAT UPON "LIKING" AND "LEARNING"

A very practical aspect of this study deals with the ways messages can be designed to maximize or optimize student preferences and achievement. Seven complexity profiles and ten formats were designed into the study so that these patterns could be replicated and studied for broader generalizations than non-replicated designs would permit. Table 1 summarizes our findings.

By studying the more productive profiles and formats, message designers will be able to adapt any appropriate content to the patterns that maximize instructional radio effectiveness.

### Profiles

Seven complexity profiles were selected for this study. Each complexity total is equal, but the profiles are varied systematically. With the exception of the "flat" profile (MMMM) which was used twice, each profile was employed three times to permit broader generalization. Table 2 displays these formats and summarizes the findings relative to each. The values of "high", "medium", and "low" were defined as scale points "6", "4", and "2" respectively on a seven-point scale.

One profile emerged as clearly the best, and two were identified as the least worthy. Values were assigned to each profile according to the scale defined on Table 2. The composite value served as the basis for ranking the profiles in terms of overall desirability. For these purposes preference and achievement were assumed to be equally important considerations.

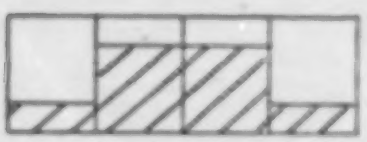
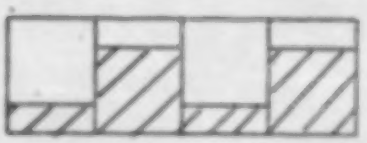
TABLE 1

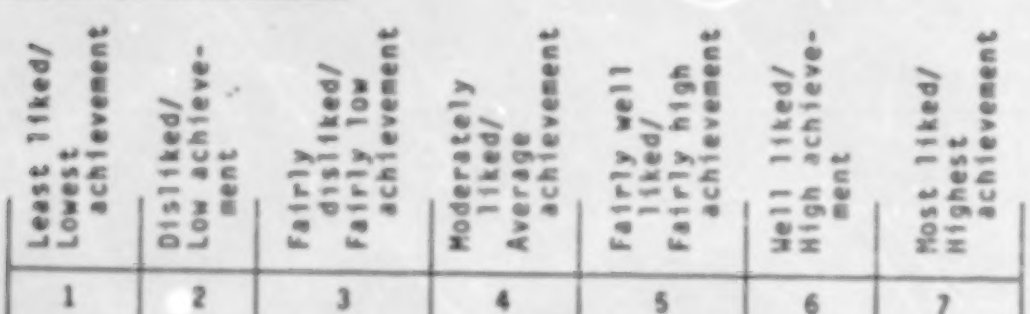
RANK ORDER DATA ON STUDENT PREFERENCES AND ACHIEVEMENT

| Program Number | Title | "Liking" Rank | "Learning" Rank | Profile | Format |
|---|---|---|---|---|---|
| 1 | Overview | 13 | 2 | MMMM | Variety |
| 2 | Look into Future | 6 | 10 | MLML | Dram. |
| 3 | Look into Present | 4 | 18 | MLLM | Panel |
| 4 | Look into Past | 3 | 17 | MMLL | Narrative |
| 5 | Information Overload | 1 | 1 | MMLL | Class Lect. |
| 6 | Human Information Processing | 2 | 16 | LMML | Dram. |
| 7 | Reduction of Reality... | 11.2 | 9 | MLML | Soc. Dial. |
| 8 | Symbolic Systems | 14.5 | 8 | LMLM | Expl. Lect. |
| 9 | Semantics | 11.5 | 11 | MLLM | Expl. Lect. |
| 10 | Message Design | 17 | 12 | LMLM | Interview |
| 11 | Dyad Dynamics | 5 | 14 | MLML | Panel |
| 12 | Attitudes, Beliefs, Personality | 7.5 | 4 | MMLL | Demo Lect. |
| 13 | Value Systems | 10 | 6 | LLMM | Readings |
| 14 | Basic Networks | 9 | 7 | LLMM | Demo Lect. |
| 15 | Complex Organizations | 16 | 3 | MLLM | Narrative |
| 16 | Facts and Inferences | 14.5 | 15 | LMLM | Soc. Dial. |
| 17 | Reasoning Models | 18 | 5 | LMML | Class Lect. |
| 18 | Critical Research | 7.5 | 13 | LLMM | Readings |
| 19 | Empirical Research | 19 | 19 | LMML | Interview |
| 20 | Conscious Integration | 20 | 20 | MMMM | Variety |

TABLE 2

PROFILE CHARACTERISTICS AND VALUES

| Rank | DIV DEN ENG TEN | | Composite Values |
|---|---|---|---|
| 1 | | Most liked; Highest achievement (7) (7) | ((14)) |
| 2 | | Fairly well liked; High achievement (5) (6) | ((11)) ((11)) |
| 3 | | Well liked; Average achievement (6) (4) | ((10)) |
| 4 | | Moderately liked; Fairly high achievement (4) (5) | ((9)) |
| 5 | | Least liked; Average achievement (1) (4) | ((5)) |
| 6.5 |  | Fairly disliked; Lowest achievement (3) (1) | ((4)) |
| 6.5 |  | Disliked; Low achievement (2) (2) | ((4)) |



Profile Ranked #1. The profile most liked and the one that produced the highest achievement stood well isolated from the others. It is characterized by high diversity and density and low engagement and tension. This is probably the best profile for designing instructional instructional radio material, and it reminds the designer to employ as much audio variety as well as structural variety as possible. It permits treatment of high density content; it limits student participation and involvement; and it keeps tensions low. One might expect that "engagement" would be high in the most fitting profile since radio is often thought to be inherently engaging. Active cognitive participation may well be important in radio entertainment, but to the extent that is so, radio entertainment and radio instruction appear to be distinctly separate categories.

Profile Ranked #2. This profile is the exact opposite of the most advantageous profile. It suggests that when engagement and tension are emphasized, it must be done at the expense of density and diversity. Theoretically, diversity and density have been conceptualized as signal characteristics and engagement and tension as response characteristics. This "mirror image" suggests that the characteristics of the signal should vary together and offset the response variables which also vary together. Thus, if a message designer is working with a low-density message, s/he ought to heighten response characteristics and keep diversity low. Exploratory lessons where little established content is available might use this profile effectively.

Profile Ranked #3. Highly diverse and engaging message work fairly well for radio instruction when the content is of low density and tensions are kept low. This offers an alternative for developing

messages of low density.

Profile Ranked #4. Another option for developing low density content combines high diversity and tension, but permitting little engagement. This might be analogous to a well-staged spectator event with strong conflict, shock, and suspense and a wide range of sensory stimuli--perhaps a reinactment of a historic battle with a variety of sound effects.

Profile Ranked #5. Although this profile possesses the appropriate overall complexity level, the distribution of the elements is flat and tends to be uninteresting and perhaps annoying--monotonous. Material can be learned moderately well with this profile, but the process is tedious.

Profiles Ranked #6.5. The two least effective profiles share in common low diversity and high density. Consider the stereotyped classroom situation in which much material is to be covered within the period and the diversity elements are limited to seeing and hearing the professor and seeing a few scribbles on the black board. This stereotype equates with unpopular and ineffective instruction. In one case tensions are high, perhaps because of the threat of failure; in the other case engagement (perhaps through class discusison) is high, but at a predictable, non-exciting level of tension normally called boredom. Perhaps one reason radio instruction efforts of the past have been found lacking is that all too often microphones have been taken into the stereotyped classroom, or stereotyped lectures have been invited into the studio. Neither process uses radio with the integrity it deserves to serve instructional needs.

Formats

Each format was used twice in order to broaden the base for generalization. The pooled values for each format are shown in Table 3 for preference, achievement, and then composite values for both preference and achievement (assuming them to be equally important). These composite values represent the best compromise between preference and achievement.

Better formats. The better formats for radio instruction appear to be the demonstration lecture. It represents tne highest achievement and high preference value. The two demonstrative lectures used in this study were: Program 12,, "Attitudes, Beliefs, and Personality", and Program 14, "Basic Networks". The single most effective program (discounting averaging of formats) was Program 5, "Information overload", a demonstrative lecture.

The qualities shared by the "better" formats include: (1) Explicit statement of points, (2) Clearly identified information chunks, (3) Clear and simple structure, and (4) Tight economical style.

The Mediocre Formats. These formats include the dramatization, the narration, the explanatory lecture, and the panel. Perhaps the most noticable characteristic of this group is that they are more attractive than effective. Perhaps they match the listener's expectations of radio's proper use and are thus more appealing, but they do not produce the learning that is commensurate with their appeal.

The Weaker Formats. The formats least useful for instructional radio, according to our findings, include the socratic dialogue, the interview, and the variety show. These formats were neither popular nor effective as compared with the others. The shared characteristics which may explain their ineffectiveness include: (1) The absence of a structure

that can be anticipated; (2) Lack of economic style; (3) Non-explicit separation of points ans supports; (4) Implied rather than explicit statement of the central idea.

Generalized Format Categories. Table 4 presents the rankings for the broad format categories under which the more specific ones were subsumed. When the specific format rankings were pooled the resulting rank order placed the lecture category in the most desireable position. This finding is contrary to a popular sentiment which holds the lecture to be among the least effective modes of instruction. However, for purposes of radio instruction--especially when designed according to appropriate complexity profiles--the lecture appears to be the best mode of instruction examined in this study.

A broad conclusion drawn from this examination of formats is that instructional radio is not to be equated with entertainment radio, or news radio, or public radio. Not only do they serve different purposes and require different modes of evaluation, but they must also be programed by different formats.

Some Correlative and Differential Relationships.

A very significant correlation was discovered between student's preferences and the order of presentation (rho=.61; t=3.2657; p<.01). This relationship is probably confounded by both deterioriation of a novelty effect as well as a tendency for the content to become more technical and specific as the course progressed. There was no corresponding correlation between order of presentation and achievement on the tests, however (rho=.22). This finding raised the question of whether student preference and test achievement are related. We found that they appear to be almost completely independent (rho=.058 This suggests a rule of thumb over which there is some popular controversy

namely: instructional material does not have to be liked in order to be learned.

We also discovered no significant differences between scripted and non-scripted programs on the variable of student preferences (average rank differences=.21), nor did we find a significant difference between student-written and instructor-written programs as they related to student preferences (average rank differences=.41). However, in regard to achievement, scripted programs were very significantly more effective than non-scripted programs ($t=7.2869$, $p<.001$). The rule of thumb in this context seems to be: instructor-written scripted programs are better for learning, but student-written and non-scripted programs are competitive with instructor-written scripts for student preferences.

Summary of the composite "ideal" Instructional Radio Message

Although there are several very adequate ways of programming for instructional radio, a composite of the most outstanding features found in this study yields this generalized message prescription:

1. For high diversity, use: (a) several different voices; (b) multiple, simultaneous voices; (c) varied musical styles; (d) imitative and abstracted sound effects; (e) poetic passages; (f) dialogue; (g) choral responses; (h) audience reaction and emotional reaction sound effects; (i) varied supportive materials; (j) varied language styles.

2. For high density, use: (a) one or two supports per chunk; (b) movement from general to specific and/or from figurative to literal; (c) both overview and summary of point structure; (d) no pauses at transition points; (e) one or two word transitions; (f) no restatement or paraphrase of points, (g) approximately ten information chunks per program.

3. For low engagement, use: (a) minimal praise or encouragement; (b) no explicit invitation to visualize, (c) high non-immediacy language; (d) little reference to the utility, significance, value, or importance of the message; (e) provided rather than elicited examples; (f) explicit rather than implied conclusions; (g) no activity other than listening.

4. For low tension, use: (a) no interruption of thought; (b) no constructed expectations; (c) minimal time between problem and solution or hope of a solution; (d) no shocks; (e) no suspense; (f) explicit emphasis on pleasantness, ease, confidence, etc.; (g) homogeneous, non-descript music; (h) quick resolution of inconsistencies and apparent conflicts.

5. Use a demonstrative lecture format produced from a tight script written by an instructor well trained in message design and writing. A demonstrative lecture will use the aural medium to display, illustrate, or demonstrate the main principles or points of the lecture. For example: "A submissive person's voice and language sound like this...".

A Prescription to Avoid.

A composite program that has a high probability of failure is this: A student-moderated, non-scripted interview with: (a) no diversity other than the participants' voices; (b) dense subject matter (lots of material, tightly structured with no redundancy); (c) no opportunity for the listener to participate vicariously or even be recognized as a listener; (d) tensions running high because of confict, inconsistency, or lack of opportunity to predict the course of the interview. This pattern might be appropriate elsewhere, but not for radio instruction.

APPENDIX C

Evaluation Report

The purpose of this statistical evaluation was to determine whether achievement under an audio-mediated format was equal to or better than achievement under a typical classroom format.

A number of measures were taken during the course of the semester. At the beginning of the semester students completed a form requesting a variety of demographic information (age, sex, year in school, etc). At three different intervals during the semester the three achievement tests were given. Finally, at the conclusion of the semester the participants were asked to complete an attitude toward mode of instruction measure.

Three types of data analyses were completed:

1. Criterion-oriented analysis.
2. Experimental-design analysis.
3. Multivariate analysis.

The criterion-oriented analysis was designed to determine at what level students performed on the achievement tests under the two types of instruction.

The experimental-design analyses used analysis of variance tests to determine the effect of mode of instruction on achievement and attitude toward instructional mode. More complex analyses of variance were run to see if age or sex moderated the effects of mode of instruction on student achievement of attitude.

Finally, the multivariate analyses were used to determine which variables most clearly distinguish between the effects of the two modes of instruction.

The remainder of this report is divided into three sections: The following section if a brief summary of the results of all three types of analyses.

The next section, the bulk of the report, contains the statistical analyses and is divided into four section:

1. Characteristics of the Student Population.
2. Criterion-oriented Analysis.
3. Experimental Design Analysis.
4. Multivariate Analysis.

The final section, Appendix A, compares the characteristics of students enrolled in the two different types of classes.

# STATISTICAL ANALYSES

1. Characteristics of the Student Population:

The typical student enrolled in the ON/AIR Project classes was between 18 and 30 years of age, an upper division student, Caucasian, female, and single. This student maintained a reported GPA of 3.0 or higher, worked 10 or more hours per week, and took the course to fulfill a requirement. A total of 171 students participated in the evaluation procedures.

There were no significant differences between students enrolled in the two types of instruction classes on any of the nine demographic variables.

2. Criterion-Oriented Analyses:

The number of students obtaining 70% or more correct answers on the three achievement tests was relatively small regardless of the mode of instruction (18% on Test 1; 10% on Test 2, and 3% on Test 3). On the other hand, if we treat these scores as norms, the students enrolled in the radio classes consistently achieved higher levels of performance. This conclusion is supported by the finding that for each of the achievement tests a larger percentage of the students enrolled in the radio sections fall in the 70% + correct category and a smaller percentage fall in the less than 50% correct category when compared to students enrolled in the regular classroom sections.

3. Experimental Design Analysis:

Students enrolled in the radio class did significantly better on the achievement tests than students enrolled in the classroom mode of instruction.

Sex of student was not related to mode of instruction in terms of performance on the three achievement tests.

Age of student was not related to mode of instruction in terms of performance on the three achievement tests.

Reported GPA of student was not related to mode of instruction in terms of performance on the three achievement tests.

The mean attitude scores for both modes of instruction represented a positive attitude. The scores for attitude toward classroom instruction were significantly more positive than scores for attitude toward radio instruction. (This outcome was related to age of student as described below).

Attitude toward mode of instruction was not found to be related to sex of student.

The relationship between age of student and attitude toward mode of instruction is somewhat complex. The younger students (18-30 years old) were less favorably disposed toward the radio mode than the older students (31 + years of age). There were no differences in attitude due to age for the classroom mode.

Attitude toward mode of instruction was not found to be related to reported GPS of student.

4. Multivariate Analyses:

Several multiple regression analyses were run using the demographic variables as independent variables. Only two variables were significantly related to achievement test scores: mode of instruction and attitude toward mode of instruction. Only two variables were significantly related to attitude toward mode of instruction: mode of instruction and age of student.

Severly discriminant analyses were run using demographic variables and achievement and attitude scores as discriminating variables. Test 1 scores and attitude toward mode of instruction were found to be the best discriminating variables between the two types of instruction. These two variables resulted in 70.2% cases correctly classified.

## 1. Characteristics of the Student Population

Students enrolled in the ON/AIR Project classes completed a form giving a number of demographic characteristics. This section gives a breakdown of these characteristics.

### 1.1 Age

| Category | N | % | Cumulative % |
|---|---|---|---|
| Under 18 | 0 | 0.0 | 0.0 |
| 18-21 | 67 | 39.2 | 39.2 |
| 22-30 | 60 | 35.1 | 74.3 |
| 31-40 | 19 | 11.1 | 85.4 |
| 41 and older | 9 | 5.3 | 90.7 |
| Unknown | 16 | 9.4 | 100.0 |

### 1.2 Year in School

| Category | N | % | Cumulative % |
|---|---|---|---|
| Freshman | 6 | 3.5 | 3.5 |
| Sophomore | 20 | 11.7 | 15.2 |
| Junior | 72 | 42.1 | 57.3 |
| Senior | 50 | 29.2 | 86.5 |
| Graduate | 7 | 4.1 | 90.6 |
| Unknown | 16 | 9.4 | 100.0 |

### 1.3 Major

| Category | N | % | Cumulative % |
|---|---|---|---|
| Communication Studies | 51 | 29.8 | 29.8 |
| Social Studies or Humanities | 16 | 9.4 | 39.2 |
| Natural or Physicial Sciences | 1 | .6 | 39.8 |
| Business or Public Administration | 7 | 4.1 | 43.9 |
| Other | 80 | 46.8 | 90.7 |
| Unknown | 16 | 9.4 | 100.0 |

1.4 Ethnic Background

| Category | N | % | Cumulative % |
|---|---|---|---|
| American Indian | 2 | 1.2 | 1.2 |
| Asian-American | 8 | 4.7 | 5.9 |
| Black | 14 | 8.2 | 14.1 |
| Caucasian | 122 | 71.3 | 85.4 |
| Mexian-American | 8 | 4.7 | 90.1 |
| Unknown | 17 | 9.9 | 100.0 |

1.5 Reported GPA

| Category | N | % | Cumulative % |
|---|---|---|---|
| Under 2.0 | 1 | .6 | .6 |
| 2.0 - 2.5 | 19 | 11.1 | 11.7 |
| 2.5 - 3.0 | 36 | 21.1 | 32.8 |
| 3.0 - 3.5 | 71 | 41.5 | 74.3 |
| 3.5 - 4.0 | 27 | 15.8 | 90.1 |
| Unknown | 17 | 9.9 | 100.0 |

1.6 Sex

| Category | N | % | Cumulative % |
|---|---|---|---|
| Male | 49 | 28.7 | 28.7 |
| Female | 106 | 62.0 | 90.7 |
| Unknown | 16 | 9.4 | 100.0 |

1.7 Number of Units Carrying this Semester

| Category | N | % | Cumulative % |
|---|---|---|---|
| 3 | 2 | 1.2 | 1.2 |
| 6 | 5 | 2.9 | 4.1 |
| 9 | 11 | 6.4 | 10.5 |
| 12 | 49 | 28.7 | 39.2 |
| 15 or more | 88 | 51.5 | 90.7 |
| Unknown | 16 | 9.4 | 100.0 |

1.8 Number of Hours Employed

| Category | N | % | Cumulative % |
|---|---|---|---|
| Full-Time | 21 | 12.3 | 12.3 |
| 20-40 hours | 40 | 23.4 | 35.7 |
| 10-20 hours | 39 | 22.8 | 58.5 |
| Not working | 55 | 32.2 | 90.7 |
| Unknown | 16 | 9.4 | 100.0 |

1.9 Why Taking This Course

| Category | N | % | Cumulative % |
|---|---|---|---|
| Experimental Nature of Course | 3 | 1.8 | 1.8 |
| Required for Comm. Studies | 57 | 33.3 | 35.1 |
| Required by Ryan Act | 55 | 32.2 | 67.3 |
| Fulfill G.E. Requirement | 13 | 7.6 | 74.9 |
| Subject Matter of Course | 24 | 14.0 | 88.9 |
| Unknown | 19 | 11.1 | 100.0 |

1.10 Marital Status

| Category | N | % | Cumulative % |
|---|---|---|---|
| Single | 117 | 68.4 | 68.4 |
| Married | 38 | 22.2 | 90.4 |
| Unknown | 16 | 9.7 | 100.0 |

Summary

The typical student enrolled in the ON/AIR Project classes was between 18 and 30 years of age, an upper division student, caucasian, female, and single. This student maintained a reported GPA of 3.0 or higher, worked 10 or more hours per week, and took the course to fulfill a requirement. A total of 171 students participated in the evaluation procedures.

1.11 Comparison of Demographics for those enrolled in the two types of classes.

The students enrolled in the two different types of classes were compared on nine demographic variables (age, sex, marital status, etc.). There were no significant differences on any of these nine variables between the two groups ( See Appendix A for analyses).

2. Criterion Oriented Analysis

The criterion-oriented analysis reveals whether or not the students learned the material presented during the course. We used three multiple choice comprehension tests and a set of integrative and concept papers to measure student achievement.

## 2.1 Multiple Choice Test Results

The content of the course was divided into 18 units. Test 1 covered units 1-6, Test 2 covered units 7-12, and Test 3 covered units 13-18. Test 1 was administered approximately on-third of the way through the course, Test 2 approximately two-thirds way through the course, and Test 3 during finals week. Test 1 contained 48 items, Test 2 contained 45 items, and Test 3 contained 60 items. The overall mean scores for each test were a follows:

| | Mean | SD | Range |
|---|---|---|---|
| Test 1 | 28.49 | 5.16 | 14-41 |
| Test 2 | 25.56 | 5.95 | 10-41 |
| Test 3 | 28.38 | 7.15 | 16-47 |

The average reliability for Test 1, Test 2 and Test 3 was .70, .75, and .76 respectively.

The four participating lcasses fell into two groups. Two of the classes particpiated in the instructional radio programs and two classes received tradition classroom instruction. There were 74 students enrolled in the radio classes and 97 students enrolled in the traditional classroom instruction classes.

### 2.1.1 Multiple Choice Test Achievement Levels

A crosstabs analysis was run for each test. Variable one was type of instruction and variable two wac level of achievement. Level of instruction was divided into three categories:

1: less than 50% correct.

2: 50 thru 69% correct.

3: 70% or more correct.

Tables 2.1 through 2.3 give the results of these analysis.

TABLE 2.1

Crosstab Results for Test 1

| | ACHIEVEMENT LEVEL | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | |
| | <50% | 50-69% | 70% + | Total |
| **Type of Instruction:** | | | | |
| **Radio** | | | | |
| N | 20 | 44 | 20 | 74 |
| % | 13.5 | 59.5 | 27.0 | |
| **Classroom** | | | | |
| N | 20 | 67 | 10 | 97 |
| % | 20.6 | 69.1 | 10.3 | |
| **Total** | | | | |
| N | 30 | 111 | 30 | 171 |
| % | 17.5 | 64.9 | 17.5 | 100% |

Chi Square = 849 Significance .014
Contingency Coefficient = .22

TABLE 2.2

Crosstab Results for Test 2

| | ACHIEVEMENT LEVEL | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | |
| | <50% | 50-69% | 70%+ | Total |
| **Type of Instruction:** | | | | |
| **Radio** | | | | |
| N | 20 | 37 | 13 | 70 |
| % | 28.6 | 52.9 | 18.6 | |
| **Classroom** | | | | |
| N | 42 | 48 | 4 | 94 |
| % | 44.7 | 51.1 | 4.3 | |

Total

| | | | | |
|---|---|---|---|---|
| N | 62 | 85 | 17 | 164 |
| % | 37.8 | 51.8 | 10.4 | 100.0 |

Chi Square = 10.71 Significance = .005
Contingency Coefficient = .25 Missing cases = 7

TABLE 2.3

Crosstab Results for Test 3

ACHIEVEMENT LEVEL

| | 1 | 2 | 3 | |
|---|---|---|---|---|
| | <50% | 50-69% | 70%+ | Total |
| Type of Instruction: | | | | |
| Radio | | | | |
| N | 38 | 29 | 3 | 70 |
| % | 54.3 | 41.4 | 4.3 | |
| Classroom | | | | |
| N | 72 | 21 | 2 | 95 |
| % | 75.8 | 22.1 | 2.1 | |
| Total | | | | |
| N | 110 | 50 | 5 | 165 |
| % | 66.7 | 30.3 | 3.0 | 100.0 |

Chi Square = 8.39 Significance = .015
Contingency Coefficient = .22 Missing Cases: 6

Summary

Our first observation is that regardless of the mode of instruction, the number of students obtaining 70% or more correct answers was quite small for all three tests. This may be in part due to the multiple choice tests. They were designed for this project and some items on each test could be improved.

On the other hand, if we treat these scores as norms the students enrolled in the radio classes consistently achieve higher levels of performance. This conclusion is supported by the finding that for each test a larger percentage

of the radio students fall in the 70%+ category and a smaller percentage of the radio students fall in the <50% category when compared to those enrolled in the classroom sections.

2.2 Integrative and Concept Papers

Preparing integrative and concept papers was an optional assignment for both radio and classroom courses. A total of 44 students in both types of classes elected to complete this assignment. The concept and integrative papers were assigned one of three grades by an independant rater. The rater had previously completed CS100A and did not know the class membership of the students. The papers were assigned one of three grades: superior, adequate and deficient. The results of these analyses are found in Tables 2.4 and 2.5.

TABLE 2.4

Crosstabs for Concept Papers

| | | ACHIEVEMENT LEVEL | | | |
|---|---|---|---|---|---|
| | | Superior | Adequate | Definient | Total |
| Type of Instruction: | | | | | |
| Radio | | | | | |
| | N | 5 | 9 | 4 | 18 |
| | % | 27.7 | 50.0 | 22.2 | |
| Classroom | | | | | |
| | N | 12 | 8 | 6 | 26 |
| | % | 46.1 | 30.7 | 23.1 | |
| Total | | | | | |
| | N | 17 | 17 | 10 | 44 |
| | % | 38.6 | 38.6 | 22.7 | 100 |

Chi- quare = 16.02 Signifance = .001

TABLE 2.*

Crosstabs for Integrative Papers

| | ACHIEVEMENT LEVEL | | | |
|---|---|---|---|---|
| | Superior | Adequate | Deficient | Total |
| Type of Instruction: | | | | |
| Radio | | | | |
| N | 6 | 9 | 2 | 17 |
| % | 35.2 | 52.9 | 11.7 | |
| Classroom | | | | |
| N | 10 | 9 | 6 | 25 |
| % | 40.0 | 36.0 | 24.0 | |
| Total | | | | |
| N | 16 | 18 | 8 | 42 |
| % | 38.1 | 42.8 | 19.1 | 100 |

Chi-Square = 6.86 Significance = .05

Summary

As might be expected, most of the concept and integrative papers were judged adequate or above from both types of classes. More of the concept papers from the classroom mode of instruction were judged superior. The same percentage of papers from both types of classes were judged deficient.

A higher percentage of the integrative papers from the classroom mode of instruction were rated deficient and a higher percentage of the integrative papers from the radio class were judged adequate about the same percentage from both types of classes were judged superior.

3. Experimental Design Analysis

Whereas the criterion-oriented analysis answers the question of whether the program works the experimental design analysis answers the question of whether one mode of instruction works better than other modes of instruction. A post-test only

control group design was used for the following set of analyses. The unique feature of this design is that dependent measures are taken after the treatment has been administered.

3.1 Mode of Instruction and Achievement

Mode of instruction entails two levels: radio and classroom instruction. Level of achievement was measured by the three comprehension tests. Three analyses of variance were run, one for each multiple choice test.

TABLE 3.1

ANALYSIS OF VARIANCE FOR TEST 1

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 235.48 | 1 | 235.48 | 9.28 | .003 |
| Error | 4212.52 | 166 | 25.38 | | |
| Total | 4448.00 | 167 | | | |

| Group | Count | Mean | Min | Max |
|---|---|---|---|---|
| Radio | 72 | 29.86 | 15 | 39 |
| Classroom | 96 | 27.47 | 14 | 41 |

TABLE 3.2

ANALYSIS OF VARIANCE FOR TEST 2

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 250.00 | 1 | 250.00 | 7.35 | .007 |
| Error | 5409.68 | 159 | 34.02 | | |
| Total | 5659.68 | 160 | | | |

| Group | Count | Mean | Min | Max |
|---|---|---|---|---|
| Radio | 72 | 26.94 | 10 | 41 |
| Classroom | 89 | 24.44 | 14 | 36 |

Missing Cases: 10

TABLE 3.3

ANALYSIS OF VARIANCE FOR TEST 3

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 783.28 | 1 | 738.28 | 16.89 | .001 |
| Error | 7733.40 | 156 | 46.37 | | |
| Total | 8016.68 | 157 | | | |

| Group | Count | Mean | Min | Max |
|---|---|---|---|---|
| [illegible] | 64 | 31.08 | 17 | 47 |
| Class[illegible] | 94 | 26.54 | 16 | 44 |

Missing Cases: 13

Summary

All three analyses support the conclusion that the students in the radio class did significantly better on the achievement tests than students in the classroom mode of instruction.

3.3 Attitude Toward Mode of Instruction

A ten item semantic differential attitude scale was developed to measure attitude toward mode of instruction. The scale and instructions are found in Figure 3.1. The items were selected from: Gary Cronkhite, "Scales Measuring General Evaluation with Minimal Distortion", Public Opinion Quarterly, 41 (1977): 65-73. This measuring instrument was administered during finals week. The results of this analysis is found in Table 3.4.

The possible range of scores on this instrument runs from 10 through 50. The higher the score the more positive the attitude. A score of 30 would be considered neutral; scores less than 30 would represent a negative attitude and scores greater than 30 would represent a positive attitude.

TABLE 3.4

ANALYSIS OF VARIANCE FOR ATTITUDE TOWARD MODE OF INSTRUCTION

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 667.85 | 1 | 677.85 | 15.08 | .001 |
| Error | 5348.67 | 119 | 44.95 | | |
| Total | 6026.52 | 120 | | | |

| Group | Count | Mean | Min. | Max |
|---|---|---|---|---|
| Radio | 61 | 35.03 | 18 | 47 |
| Classroom | 60 | 39.77 | 27 | 50 |

Missing Cases: 50

Summary:

The mean score for each mode of instruction represents a positive attitude. The scores for attitude toward classroom instruction were significantly more positive than scores for attitude toward radio instruction.

FIGURE 3.1

INSTRUMENT FOR MEASURING ATTITUDE TOWARD MODE OF INSTRUCTION

Following is a set of items that assess your feelings about the mode of instruction for your C.S. 100A class. By mode of instruction, we mean whether your class is primarily lecture-discussion, self-study audio-tape, and so on. This is not an evaluation of your instructor. We want to obtain your feelings about the method used to teach C.S. 100A. Note that we want your reaction to the method used to teach this particular class, C.S. 100A, but not all classes you are now taking.

Instructions: You will notice that each item is composed of bi-polar adjectives:

Fast A B C D E Slow

You are to mark the blank on the answer sheet that best represents your reaction to the mode of instruction.

For example: if you thought the mode of instruction was very fast you would mark "A". If you thought the mode of instruction was very slow you would mark "E". If you thought the mode of instruction was about half-way between fast and slow, you would mark "C", and so on. Be sure to read each item carefully and be sure to mark every item.

| | | | | | | |
|---|---|---|---|---|---|---|
| FAVORABLE | A | B | C | D | E | UNFAVORABLE |
| MEANINGLESS | A | B | C | D | E | MEANINGFUL |
| PAINFUL | A | B | C | D | E | PLEASURABLE |
| WORTHLESS | A | B | C | D | E | VALUABLE |
| FOOLISH | A | B | C | D | E | WISE |
| INTELLIGENT | A | B | C | D | E | STUPID |
| RESPONSIBLE | A | B | C | D | E | IRRESPONSIBLE |
| PLEASING | A | B | C | D | E | ANNOYING |
| STIMULATING | A | B | C | D | E | DULL |
| UNPLEASANT | A | B | C | D | E | PLEASANT |

3.3 Relationship of Sex and Age of Students, and Mode of Instruction with Level of Achievement.

Two-way analyses of variance were run to determine if sex or age was related to higher levels of achievement under either mode of instruction. Since cell sizes were unequal a least squares analysis was used ( Option 9 of the SPSS ANOVA Subroutine).

3.3.1 Sex, Mode of Instruction and Level of Achievement

Tables 3.5 through 3.7 give the results of the analyses for sex of student, mode of instruction and level of achievement.

TABLE 3.5

SEX OF STUDENT AND MODE OF INSTRUCTION FOR TEST 1

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 192.86 | 1 | 192.86 | 8.02 | .005 |
| Sex of Student | 25.54 | 1 | 25.54 | 1.06 | .304 |
| Sex by Mode | 15.11 | 1 | 15.11 | .63 | .430 |
| Error | 3606.93 | 150 | 24.05 | | |

Missing Observations: 16

MEANS
MODE OF INSTRUCTION

| | Radio | N | Classroom | N |
|---|---|---|---|---|
| Sex of Student: | | | | |
| Male | 28.86 | (22) | 27.50 | (26) |
| Female | 30.50 | (44) | 27.77 | (62) |

TABLE 3.6

SEX OF STUDENT AND MODE OF INSTRUCTION FOR TEST 2

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 194.89 | 1 | 194.89 | 6.27 | .013 |
| Sex of Student | 137.30 | 1 | 137.30 | 4.14 | .037 |
| Mode by Sex | 8.29 | 1 | 8.29 | .27 | .607 |
| Error | 4417.36 | 142 | 31.11 | | |

Missing Observations: 25

MEANS
MODE OF INSTRUCTION

| Sex of Student: | Radio | N | Classroom | N |
|---|---|---|---|---|
| Male | 25.50 | (22) | 23.81 | (27) |
| Female | 28.12 | (44) | 25.42 | (55) |

TABLE 3.7

SEX OF STUDENT AND MODE OF INSTRUCTION FOR TEST 3

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 695.73 | 1 | 695.73 | 14.28 | .001 |
| Sex of Student | 7.86 | 1 | 7.86 | .16 | .689 |
| Mode by Sex | .62 | 1 | .62 | .01 | .910 |
| Error | 6867.55 | 141 | 48.71 | | |

Missing Observations: 26

MEANS
MODE OF INSTRUCTION

| Sex of Student: | Radio | N | Classroom | N |
|---|---|---|---|---|
| Male | 30.79 | (19) | 26.50 | (26) |
| Female | 31.46 | (39) | 26.89 | (61) |

Summary

None of the analyses indicate that the achievement of students under either mode of instruction is related to sex of students. Also, except for Test 2, males and females performed about equally well.

3.3.2 Age, Mode of Instruction, and Level of Achievement

Tables 3.8 through Tables 3.10 give the results of the analyses for age of student, mode of instruction, and level of achievement.

TABLE 3.8

AGE OF STUDENT AND MODE OF INSTRUCTION FOR TEST 1

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 192.86 | 1 | 192.86 | 8.59 | .004 |
| Age of Student | 289.79 | 2 | 144.90 | 6.45 | .002 |
| Mode by Age | 33.28 | 2 | 16.64 | .74 | .478 |
| Error | 3324.51 | 148 | 22.46 | | |

Missing Observations: 17

MEANS
MODE OF INSTRUCTION

| Age of Student: | Radio | N | Classroom | N |
|---|---|---|---|---|
| 18 - 21 | 27.92 | 24 | 26.81 | 43 |
| 22 - 30 | 32.07 | 29 | 28.97 | 30 |
| 30 + | 29.00 | 13 | 27.67 | 15 |

MULTIPLE COMPARISONS FOR AGE
(Scheffe .10 Level)

| Comparison | | | Significant |
|---|---|---|---|
| 18 - 21 | with | 22 - 30 | yes |
| 18 - 21 | with | 31 + | no |
| 22 - 30 | with | 31 + | no |

TABLE 3.9

AGE OF STUDENT AND MODE OF INSTRUCTION FOR TEST 2

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 194.89 | 1 | 194.89 | 6.50 | .012 |
| Age of Student | 244.02 | 2 | 122.01 | 4.07 | .019 |
| Mode by Age | 119.66 | 2 | 59.83 | 2.00 | .140 |
| Error | 4199.27 | 140 | 30.00 | | |
| Missing Observations: 25 | | | | | |

MEANS
MODE OF INSTRUCTION

| Age of Student: | Radio | N | Classroom | N |
|---|---|---|---|---|
| 18 - 21 | 24.45 | 22 | 24.59 | 39 |
| 22 - 30 | 39.59 | 29 | 25.66 | 29 |
| 31 + | 36.62 | 13 | 24.14 | 14 |

MULTIPLE COMPARISONS FOR AGE
(Scheffe, .10 Level)

| Comparison | | | Significant |
|---|---|---|---|
| 18 - 21 | with | 22 - 30 | yes |
| 18 - 21 | with | 31 + | no |
| 22 - 30 | with | 31 + | no |

TABLE 3.10

AGE OF STUDENT AND MODE OF INSTRUCTION FOR TEST 3

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 695.73 | 1 | 695.73 | 14.55 | .001 |
| Age | 91.55 | 2 | 45.77 | .96 | .387 |
| Mode by Age | 135.83 | 2 | 67.92 | 1.42 | .245 |
| Error | 6648.64 | 139 | 47.83 | | |
| Missing Observations: 26 | | | | | |

MEANS
MODE OF INSTRUCTION

| Age of Student: | Radio | N | Classroom | N |
|---|---|---|---|---|
| 18 - 21 | 29.24 | 21 | 26.53 | 43 |
| 22 - 30 | 33.40 | 25 | 28.66 | 29 |
| 31 + | 30.25 | 12 | 27.67 | 15 |

Summary

None of the analysis show that the achievement of students under either mode of instruction is related to age of students. For Test 1 and Test 2, the 22-30 age group did better than the 18-21 group.

3.4 Relationship of Sex and Age of Students with Attitude Toward Mode of Instruction.

Two-way analyses of variance were run to determine if sex or age was related to attitude toward mode of instruction. Since cell sizes were unequal, a least squares analysis was used (Option 9 of the SPSS ANOVA Subroutine).

3.4.1 Sex of Student and Attitude Toward Mode of Instruction

Table 3.11 gives the results of the analysis for sex of student and attitude toward mode of instruction.

TABLE 3.11

SEX OF STUDENT AND ATTITUDE TOWARD MODE OF INSTRUCTION

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 732.48 | 1 | 732.48 | 15.80 | .001 |
| Sex of Student | 2.98 | 1 | 2.98 | .06 | .800 |
| Mode by Sex | .93 | 1 | .93 | .02 | .888 |
| Error | 5240.40 | 113 | 46.38 | | |

Missing Observations: 54

MEANS
MODE OF INSTRUCTION

| Sex of Student: | Radio | N | Classroom | N |
|---|---|---|---|---|
| Male | 34.84 | 19 | 40.11 | 19 |
| Female | 34.69 | 39 | 39.58 | 40 |

34.2 Age of Student and Attitude Toward Mode of Instruction

Table 3.12 gives the results of the analysis for age of student and attitude toward mode of instruction.

TABLE 3.12

AGE OF STUDENT AND ATTITUDE TOWARD MODE OF INSTRUCTION

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 732.48 | 1 | 732.48 | 18.32 | .001 |
| Age of Student | 604.16 | 2 | 302.08 | 7.56 | .001 |
| Mode by Age | 202.87 | 2 | 101.43 | 2.56 | .084 |
| Error | 4437.28 | 111 | 39.98 | | |

Missing Observations: 54

MEANS
MODE OF INSTRUCTION

| | Radio | N | Classroom | N |
|---|---|---|---|---|
| Age of Student: | | | | |
| 18 - 21 | 30.41 | 22 | 38.76 | 25 |
| 22 - 30 | 36.75 | 24 | 39.41 | 22 |
| 31 + | 38.67 | 12 | 42.42 | 12 |

MULTIPLE COMPARISONS
(Scheffe .10 Level)

| Comparison | Significance |
|---|---|
| 18 - 21 with 22 - 30 | yes |
| 18 - 21 with 31 + | yes |
| 22 - 30 with 31 + | No |

SIMPLE F TESTS FOR RADIO
(Scheffe .10 Level)

| Comparison | Significance |
|---|---|
| 18 - 21 with 22 - 30 | yes |
| 18 - 21 with 31 + | yes |
| 22 - 30 with 31 + | no |

SIMPLE F TESTS FOR CLASSROOM
(Scheffe .10 Level)

| Comparison | Significance |
|---|---|
| 18 - 21 with 22 - 30 | no |
| 18 - 21 with 31 + | no |
| 22 - 30 with 31 + | no |

Summary

Attitude toward mode of instruction was not found to be related to sex of student. The relationship between age of student and attitude toward mode of instruction is somewhat complex. Overall, younger students (18-30) were found to hold less favorable attitudes than older students (31 +). However, this finding holds only for those enrolled in the radio class (see results of simple F tests). The younger students (18-30) were less favorably disposed toward the radio mode than the older students (31 + years.)

3.5 Relationship of Reported GPA of Students and Mode of Instruction with Level of Achievement.

Two-way analyses of variance were run to determine if reported GPA of the students and mode of instruction was related to level of achievement. Tables 3.13 to 3.15 give the results of these analyses.

TABLE 3.13

REPORTED GPA OF STUDENT AND MODE OF INSTRUCTION FOR TEST 1

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 173.61 | 1 | 173.61 | 8.10 | .005 |
| Reported GPA | 433.37 | 3 | 144.46 | 6.74 | .001 |
| Mode by GPA | 32.47 | 3 | 10.82 | .51 | .680 |
| Error | 3087.60 | 144 | 21.44 | | |

Missing Observations: 19

MEANS
MODE OF INSTRUCTION

| GPA: | Radio | N | Classroom | N |
|---|---|---|---|---|
| 2.0 - 2.5 | 27.20 | 10 | 23.78 | 9 |
| 2.5 - 3.0 | 28.16 | 19 | 26.69 | 16 |
| 3.0 - 3.5 | 30.86 | 29 | 28.12 | 42 |
| 3.5 - 4.0 | 33.71 | 7 | 29.20 | 20 |

TABLE 3.14

REPORTED GPA OF STUDENT AND MODE OF INSTRUCTION FOR TEST 2

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 171.68 | 1 | 171.68 | 5.78 | .018 |
| Reported GPA | 425.64 | 3 | 141.88 | 4.78 | .003 |
| Mode by GPA | 54.57 | 3 | 18.19 | .61 | .608 |
| Error | 4040.34 | 136 | 29.71 | | |

Missing Observations: 27

MEANS
MODE OF INSTRUCTION

| GPA: | Radio | N | Classroom | N |
|---|---|---|---|---|
| 2.0-2.5 | 23.70 | 10 | 21.50 | 8 |
| 2.5-3.0 | 26.50 | 18 | 22.88 | 16 |
| 3.0-3.5 | 27.71 | 28 | 25.95 | 39 |
| 3.5-4.0 | 31.29 | 7 | 26.06 | 18 |

TABLE 3.15

REPORTED GPA OF STUDENT AND MODE OF INSTRUCTION FOR TEST 3

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 678.15 | 1 | 678.15 | 16.32 | .001 |
| Reported GPA | 749.15 | 3 | 249.72 | 6.01 | .001 |
| Mode by GPA | 52.72 | 3 | 17.57 | .42 | .737 |
| Error | 5608.20 | 135 | | | |

Missing Observations: 28

MEANS
MODE OF INSTRUCTION

| GPA: | Radio | N | Classroom | N |
|---|---|---|---|---|
| 2.0-2.5 | 27.22 | 9 | 23.33 | 9 |
| 2.5-3.0 | 28.22 | 18 | 24.17 | 17 |
| 3.0-3.5 | 33.42 | 24 | 27.73 | 40 |
| 3.5-4.0 | 35.50 | 6 | 27.75 | 20 |

Summary

All three analyses for level of achievement show that GPA does not differentially affect performance for either mode of instruction. Those reporting higher GPA's also obtained higher test scores.

3.6 Relationship of Reported GPA of Students and Attitude Toward Mode of Instruction.

A two-way analysis of variance was used to assess the relationship between reported GPA and attitude toward mode of instruction. Table 3.16 gives the results of this analysis.

TABLE 3.16

REPORTED GPA AND ATTITUDE TOWARD MODE OF INSTRUCTION

| Source | SS | df | MS | F | Probability |
|---|---|---|---|---|---|
| Mode of Instruction | 742.74 | 1 | 742.74 | 16.11 | .001 |
| Reported GPA | 102.09 | 3 | 34.03 | .74 | .532 |
| Mode by GPA | 151.49 | 3 | 50.50 | 1.10 | .354 |
| Error | 4979.92 | 108 | 46.11 | | |

Missing Observations:55

MEANS
MODE OF INSTRUCTION

| | Radio | N | Classroom | N |
|---|---|---|---|---|
| 2.0-2.5 | 35.56 | 9 | 36.13 | 8 |
| 2.5-3.0 | 33.44 | 18 | 39.00 | 12 |
| 3.0-3.5 | 34.54 | 24 | 41.10 | 29 |
| 3.5-4.0 | 37.67 | 6 | 39.60 | 10 |

Summary

The analysis does not indicate any relationship between reported GPA and attitude toward mode of instruction

4. Multivariate Analysis

The experimental design analysis is limited in the number of independent variables that can usefully be included in the analysis. Often a more expensive array of variables provides a more realistic picture. This section gives the results of two types of multivariate analysis that may give additional information for comparing the two modes of instruction.

## 4.1 Regression Analyses

### 4.1.1 Regression Analyses For Achievement

All the demographic variables listed in section 1 (except major) and attitude toward mode of instruction were included as independent variables. An analysis was run for each of the achievement tests. Table 4.1 gives the results for Test 1, which was typical for the three achievement tests.

TABLE 4.1

INITIAL REGRESSION ANALYSIS FOR TEST 1

| Variable | Regression Coefficient | F | Significance | Beta Coefficient |
|---|---|---|---|---|
| Mode of Instruction | -5.1 | 16.09 | .001 | -.491 |
| Age of Student | .28 | .07 | .795 | .038 |
| Year in School | -.59 | .43 | .515 | -.075 |
| Reported GPA | 1.29 | 3.58 | .063 | .222 |
| Sex | .39 | .09 | .769 | .035 |
| Units | 0.85 | .07 | .934 | .010 |
| Hours Working | .72 | 1.21 | .277 | .138 |
| Why Taking Course | .53 | .96 | .332 | .054 |
| Marital Status | -1.76 | 1.20 | .277 | -.144 |
| Attitude | .25 | 7.26 | .009 | .345 |

ANOVA

| Source | SS | df | MS | F | Significance |
|---|---|---|---|---|---|
| Due To Regression | 574.33 | 10 | 57.43 | 2.48 | .014 |
| Residual | 1462.16 | 63 | 23.21 | | |

| | |
|---|---|
| Multiple R | .531 |
| R Squared | .282 |

As can be easily determined, most of the variables do not contribute to the explanation of variance for the dependent variable. Hence, in the subsequent analyses only attitude toward mode of instruction, reported GPA, mode of instruction and sex were included as dependent variables. The results for the three achievement tests are given in Tables 4.2 to 4.4.

TABLE 4.2

FINAL REGRESSION ANALYSIS FOR TEST 1

| Variable | Regression Coefficient | F | Significance | Beta Coefficient |
|---|---|---|---|---|
| Mode of Instruction | -4.46 | 13.57 | .001 | -.239 |
| Sex | .64 | .29 | .595 | .037 |
| Reported GPA | .96 | 2.38 | .128 | .120 |
| Attitude | 21.48 | 27.35 | .001 | .329 |

ANOVA

| Source | SS | df | MS | F | Significance |
|---|---|---|---|---|---|
| Due to Regression | 439.31 | 4 | 109.83 | 4.75 | .002 |
| Residual | 1597.18 | 69 | 23.15 | | |

| | |
|---|---|
| Multiple R | .465 |
| R Squared | .216 |

TABLE 4.3

FINAL REGRESSION FOR TEST 2

| Variable | Regression Coefficient | F | Significance | Beta Coefficient |
|---|---|---|---|---|
| Mode of Instruction | -2.9[illegible] | 4.97 | .029 | -.257 |
| Sex | 1.43 | 1.25 | .267 | .120 |
| Reported GPA | 1.84 | 7.52 | .008 | .294 |
| Attitude | 12.22 | 8.19 | .006 | .330 |

ANOVA

| Source | SS | df | MS | F | Significance |
|---|---|---|---|---|---|
| Due to Regression | 510.55 | 4 | 127.64 | 4.76 | .002 |
| Residual | 1849.83 | 69 | 26.81 | | |

| | |
|---|---|
| Multiple R | .465 |
| R Squared | .216 |

TABLE 4.4

FINAL REGRESSION FOR TEST 3

| Variable | Regression Coefficient | F | Significance | Beta Coefficient |
|---|---|---|---|---|
| Mode of Instruction | -3.45 | 10.46 | .002 | -.284 |
| Sex | 1.26 | .58 | .448 | .072 |
| Reported GPA | 1.30 | 2.25 | .138 | .158 |
| Attitude | 22.22 | 3.80 | .055 | .296 |

ANOVA

| Source | SS | df | MS | F | Significance |
|---|---|---|---|---|---|
| Due to Regression | 608.62 | 4 | 152.15 | 3.39 | .014 |
| Residual | 3100.84 | 69 | 44.94 | | |

Multiple R .405
R Squared .164

Summary

All of the multiple R's were significant, but relatively small. The only two variables that consistently add to the explanation were mode of instruction and attitude toward mode of instruction.

4.1.2 Regression Analyses for Attitude Toward Mode of Instruction

All of the demographic variables listed in Section I (except major) were included as independent variables. The number of independent variables was then reduced and a second analysis was run. The results of these analyses are found in Tables 4.5 and 4.6.

TABLE 4.5

INITIAL REGRESSION FOR ATTITUDE TOWARD MODE OF INSTRUCTION

| Variable | Regression Coefficient | F | Significance | Beta Coefficient |
|---|---|---|---|---|
| Mode of Instruction | 7.57 | 12.60 | .001 | .388 |
| Age | 4.09 | 9.37 | .003 | .300 |
| Year in School | .84 | .47 | .494 | .077 |
| GPA | .83 | .83 | .365 | .104 |
| Sex | .39 | .17 | .735 | .039 |
| Units | -1.32 | .95 | .333 | -.119 |
| Hours Working | - .05 | .01 | .956 | -.007 |
| Why Taking Course | .35 | .23 | .637 | .053 |
| Marital Status | -2.51 | 1.41 | .240 | -.150 |

ANOVA

| Source | SS | df | MS | F | Significance |
|---|---|---|---|---|---|
| Due to Regression | 1152.64 | 9 | 128.07 | 3.10 | .004 |
| Residual | 2641.27 | 64 | 41.27 | | |

Multiple R .551
R Squared .304

TABLE 4.6

FINAL REGRESSION FOR ATTITUDE TOWARD MODE OF INSTRUCTION

| Variable | Regression Coefficient | F | Significance | Beta Coefficient |
|---|---|---|---|---|
| Mode of Instruction | 5.86 | 15.59 | .001 | .409 |
| Age | 3.42 | 10.65 | .002 | .338 |

ANOVA

| Source | SS | df | MS | F | Significance |
|---|---|---|---|---|---|
| Due To Regression | 945.22 | 2 | 472.61 | 11.78 | .001 |
| Residual | 2848.66 | 71 | 40.12 | | |

Multiple R .499
R Squared .249

Summary

Very little was lost in terms of explanation by reducing the number of independent variables from nine. Only two variables of those included in this study contribute to the explanation of the variation of attitude, mode of instruction and age.

4.2 Discriminant Analyses

The purpose of this analysis was to determine which variables best discriminant between the two modes of instruction and then to find how well they discriminated. All demographic variables (except major), the three achievement tests and attitude toward mode of instruction were included in the initial discriminant analysis. The results of this analysis are found in Table 4.7. The results of second and third analyses with fewer variables are found in 4.8 and 4.9. In both cases, the largest increase in generalized distance as measure by Rao's V was used to assess the best discriminating variables.

TABLE 4.7

INITIAL DISCRIMINANT ANALYSIS FOR ATTITUDE TOWARD MODE OF INSTRUCTION

| Variable | F | Wilks Lambda | SIG. | V Change | SIG |
|---|---|---|---|---|---|
| Attitude | 16.28755 | .85097 | .000 | 16.28755 | .000 |
| Test 1 | 8.83089 | .77644 | .000 | 10.49028 | .001 |
| GPA | 5.92436 | .74434 | .000 | 5.16540 | .023 |
| Marital Status | 3.74574 | .71460 | .000 | 5.20005 | .023 |
| Test 3 | 2.82217 | .69415 | .000 | 3.83435 | .050 |
| Age | 1.82424 | .68015 | .000 | 1.55938 | .212 |
| Hours Working | .96854 | .67860 | .000 | 1.50888 | .219 |
| Sex | .28146 | .67639 | .000 | .44853 | .503 |
| Units | .25920 | .67433 | .000 | .41927 | .517 |
| Why Taking Course | .18015 | .67289 | .000 | .29577 | .587 |
| Test 2 | .21140 | .67118 | .000 | .35202 | .553 |
| Year in School | .06925 | .67062 | .001 | .11701 | .732 |

STANDARIZED DISCRIMINANT FUNCTION COEFFICIENTS

| | 1 |
|---|---|
| Test 1 | -.43976 |
| Test 2 | -.11187 |
| Test 3 | -.38298 |
| Age | -.31133 |
| Year in School | .05549 |
| GPA | .53928 |
| Sex | -.11908 |
| Units | -.09162 |
| Hours Working | .23099 |
| Why Taking Course | .09238 |
| Marital Status | .25009 |
| Attitude | .94934 |

CENTROIDS OF GROUPS IN REDUCED SPACE

| | |
|---|---|
| Radio | -.76254 |
| Classroom | .63056 |

PREDICTION RESULTS

| Actual Group Name | Code | N of Cases | Predicted Group 1 | Group Membership Group 2 |
|---|---|---|---|---|
| Radio | 1 | 43 | 33.<br>76.7 | 10.<br>23.3 |
| Classroom | 2 | 52 | 12.<br>23.1 | 40.<br>76.9 |

76.8% of known cases correctly classified.

TABLE 4.8

INTERMEDIATE DISCRIMINANT ANALYSIS FOR MODE OF INSTRUCTION

| Variable | F | Wilks Lambda | SIG. | V Change | SIG. |
|---|---|---|---|---|---|
| Attitude | 16.28755 | .85097 | .000 | 16.28755 | .000 |
| Test 1 | 8.83089 | .77644 | .000 | 10.49028 | .001 |
| GPA | 3.92436 | .7 | .000 | 5.16540 | .023 |
| Marital Status | 3.74574 | .71460 | .000 | 5.20005 | .023 |
| Test 3 | 4.62217 | .69415 | .000 | 3.83435 | .050 |

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

| | 1 |
|---|---|
| Test 1 | -.48267 |
| Test 3 | -.39023 |
| GPA | .48314 |
| Martial Status | -.38049 |
| Attitude | .87198 |

CENTROIDS OF GROUPS IN REDUCED SPACE

| | |
|---|---|
| Radio | -.72224 |
| Classroom | .59723 |

PREDICITION RESULTS

| Actual Group Name | Code | N of Cases | Predicted Group 1 | Group Membership Group 2 |
|---|---|---|---|---|
| Radio | 1 | 43 | 35. | 8. |
| | | | 81.4 | 18.6 |
| Classroom | 2 | 52 | 13. | 39. |
| | | | 25.0 | 75.0 |

77.9 % of known cases correctly classified.

Chi-Square = 29.568 Significance = .000

TABLE 4.9

FINAL DISCRIMINANT ANALYSIS FOR MODE OF INSTRUCTION

| Variable | F | Wilks Lambda | SIG. | V Change | SIG. |
|---|---|---|---|---|---|
| Attitude | 15.08 | .888 | .001 | 15.08 | .001 |
| Test 1 | 12.48 | .803 | .001 | 14.18 | .001 |

STANDARIZED DISCRIMINANT FUNCTION COEFFICIENTS

| Variable | Coefficient |
|---|---|
| Attitude | .936 |
| Test 1 | .735 |

98

CENTROIDS OF GROUPS IN REDUCED SPACE

| | |
|---|---|
| Radio Group | -.488 |
| Classroom Group | .496 |

PREDICTION RESULTS

| Actual Group Name | Code | N of Cases | Predicted Group 1 | Group Membership Group 2 |
|---|---|---|---|---|
| Radio | 1 | 61 | 45.<br>73.8 | 16.<br>26.2 |
| Classroom | 2 | 60 | 20.<br>33.3 | 40.<br>66.7 |

70.2% of known cases correctly classified

Chi-Square = 19.843 Significance = .001

Summary

Of the initial 12 variables, only five are useful discriminators as indicated by Rao's V. When only these five variables are included in the analysis the number of known cases correctly classified raises by 1%. When only the best two discriminators are included (attitude and Test 1),the percent of known cases drops only 7.5%. The most parsimonious solution seems to be the last one with two variables.

COMPARISON OF STUDENTS ENROLLED IN
THE TWO TYPES OF CLASSES ON
NINE DEMOGRAPHICS

| A.1 AGE | TYPE OF INSTRUCTION | |
|---|---|---|
| | Radio | Classroom |
| Under 18 | | |
| N | 0 | 0 |
| % | 0.0 | 0.0 |
| 18 - 21 | | |
| N | 24 | 43 |
| % | 36.4 | 48.3 |
| 22 - 30 | | |
| N | 29 | 31 |
| % | 43.9 | 34.8 |
| 31 - 40 | | |
| N | 7 | 12 |
| % | 10.6 | 13.5 |
| 41 and Older | | |
| N | 6 | 3 |
| % | 9.1 | 3.4 |

Chi-Square = 4.46 Significance = .22

| A.2 YEAR IN SCHOOL | TYPE OF INSTRUCTION | |
|---|---|---|
| | Radio | Classroom |
| Freshman | | |
| N | 1 | 5 |
| % | 1.5 | 5.6 |
| Sophomore | | |
| N | 9 | 11 |
| % | 13.6 | 12.4 |
| Junior | | |
| N | 32 | 40 |
| % | 48.5 | 44.9 |
| Senior | | |
| N | 19 | 31 |
| % | 28.8 | 34.8 |

| | | |
|---|---|---|
| Graduate | | |
| N | 5 | 2 |
| % | 7.6 | 2.2 |

Chi-Square = 4.61 Significance = .33

A.3 ETHNIC BACKGROUND

| | TYPE OF INSTRUCTION | |
|---|---|---|
| | Radio | Classroom |
| American-Indian | | |
| N | 1 | 1 |
| % | 1.5 | 1.1 |
| Asian-American | | |
| N | 4 | 4 |
| % | 6.1 | 4.5 |
| Black | | |
| N | 7 | 7 |
| % | 10.6 | 8.0 |
| Caucasian | | |
| N | 52 | 70 |
| % | 78.8 | 79.5 |
| Mexican-American | | |
| N | 2 | 6 |
| % | 3.0 | 6.8 |

Chi-Square = 1.54 Significance = .82

A.4 REPORTED GPA

| | TYPE OF INSTRUCTION | |
|---|---|---|
| | Radio | Classroom |
| Under 2.0 | | |
| N | 1 | 0 |
| % | 1.5 | 0.0 |
| 2.0 - 2.5 | | |
| N | 10 | 9 |
| % | 15.2 | 10.2 |
| 2.5 - 3.0 | | |
| N | 19 | 17 |
| % | 28.8 | 19.3 |

| | | | |
|---|---|---|---|
| 3.0 - 3.5 | | | |
| | N | 29 | 42 |
| | % | 43.9 | 47.7 |
| 3.5 - 4.0 | | | |
| | N | 7 | 20 |
| | % | 10.6 | 22.7 |

Chi-Square = 5.47 Significance = .14
(under 2.0 category dropped for ChiSquare analysis)

A.5 SEX — TYPE OF INSTRUCTION

| | | Radio | Classroom |
|---|---|---|---|
| Male | | | |
| | N | 22 | 44 |
| | % | 33.3 | 66.7 |
| Female | | | |
| | N | 27 | 62 |
| | % | 30.3 | 69.7 |

Chi-Square = .05 Significance = .82

A.6 NUMBER OF UNITS CARRYING THIS SEMESTER — TYPE OF INSTRUCTION

| | | Radio | Classroom |
|---|---|---|---|
| 3 units | | | |
| | N | 1 | 1 |
| | % | 1.5 | 1.1 |
| 6 units | | | |
| | N | 2 | 3 |
| | % | 3.0 | 3.4 |
| 9 units | | | |
| | N | 6 | 5 |
| | % | 9.1 | 5.6 |
| 12 units | | | |
| | N | 23 | 26 |
| | % | 34.8 | 29.2 |
| 15 or more | | | |
| | N | 34 | 54 |
| | % | 51.5 | 60.7 |

Significance = .20

A.7 NUMBER OF HOURS EMPLOYED

| | TYPE OF INSTRUCTION | |
|---|---|---|
| | Radio | Classroom |
| Full-Time | | |
| N | 12 | 9 |
| % | 18.2 | 10.1 |
| 20-40 hours | | |
| N | 17 | 23 |
| % | 25.8 | 25.8 |
| 10-20 hours | | |
| N | 16 | 23 |
| % | 24.2 | 25.8 |
| Not Working | | |
| N | 21 | 34 |
| % | 31.8 | 38.2 |

Chi-Square = 2.30 Significance = .51

A.8 WHY TAKING COURSE

| | MODE OF INSTRUCTION | |
|---|---|---|
| | Radio | Classroom |
| Experimental Nature of the Course | | |
| N | 3 | 0 |
| % | 4.7 | 0.0 |
| Required for Communication Studies | | |
| N | 27 | 30 |
| % | 42.2 | 34.1 |
| Required by Ryan Act | | |
| N | 22 | 33 |
| % | 34.4 | 37.5 |
| Fulfill G.E. Requirement | | |
| N | 5 | 8 |
| % | 7.8 | 9.1 |
| Subject Matter of the Course | | |
| N | 7 | 17 |
| % | 10.9 | 19.3 |

Chi-Square = 2.40 Significance = .49
(Experimental Nature of the Course category not included in Chi-Square analyses.)

A.9 MARITAL STATUS

| | MODE OF INSTRUCTION | |
|---|---|---|
| | Radio | Classroom |
| **Single** | | |
| N | 45 | 72 |
| % | 68.2 | 80.9 |
| **Married** | | |
| N | 21 | 17 |
| % | 31.8 | 19.1 |

Chi-Square = 2.66 Significance = .10